



**City of Kansas City, Missouri
Water Services Department
Kelly Postlewait, Interim Director**

Project Manual

PROJECT/CONTRACT NO.: 81000819/1712

WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2

BIDDER/ADDRESS

Company
Contact
Address

Phone
Fax
Email

Project Manager: David Elge
Telephone: 816-513-0347
Email: David.Elge@kcmo.org



ADDENDUM NUMBER 1

Project Number 81000819/1712

Project Title Wastewater SCADA System Improvements

ISSUE DATE: 1/25/2024

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on **February 13, 2024**, are amended as follows:

Information to Bidders The following is provided to Bidders for information only:

1. Pre-Bid Conference Attendance List.
2. Pre-Bid Conference Slides.
3. Pre-Bid Conference Agenda.
4. To receive a combined set of drawings, please reach out directly to David Elge, David.Elge@kcmo.org
5. Pre-Bid Site Visits Schedule.
6. The city wished to clarify that the bid due date was February 13th at 2 PM.
7. The city wished to clarify that Durkin, Inc is a wholly owned subsidiary of Impact Automation.

Q1.	What is the amount of self-perform work required?
A1.	25%. – see section SC-6.07 J
Q2.	Is Pre-Bid Conference attendance mandatory to obtain the bid?
A2.	Yes.
Q3.	Is insurance required for work in flood plains?
A3.	Please refer to 00515 – Contract Required Submissions for information on insurance requirements.
Q4.	Will any work be done within FAA fences?
A4.	All work near the downtown airport and KCI will be performed in areas with general access.
Q5.	Where are the bids dropped off?
A5.	The bid drop box at the Water Services Building at 4800 E 63rd Street.

Q6.	Who will acquire RR flaggers for the RR work?
A6.	Contractor will be responsible for flaggers, to meet railroad ROW work, permitting requirements. This cost will be covered under the project allowance and no cost should be included in the bid.
Q7.	Please provide confirmation of the 3 approved integrators.
A7.	1) R.E. Pedrotti Company 2) Integrated Controls 3) Durkin, Inc.

Specifications

1. Replace section 00800 with an updated version.
2. Replace section 00410 with an updated version.
3. Replace section 00413 with an updated version.
4. Replace section 01210 with an updated version.

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

**City of Kansas City, Missouri Water Services Department
Wastewater SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741**

**Pre-Bid Conference
Virtual Teams Meeting Participation**

Wednesday, January 17, 2024 at 9:00 am

	NAME	COMPANY NAME	ADDRESS	PHONE	EMAIL
1.	Elge, David	KC Water	4800 E. 63 rd St. Kansas City, MO 64130	816-209-8850	David.Elge@kcmo.org
2.	Herrera, Christopher	KC Water	4800 E. 63 rd St. Kansas City, MO 64130	816-512-0355	Chris.Herrera@kcmo.org
3.	Dallas Massie	R.E. Pedrotti			dallasm@repedrotti.com
4.	Steve McGhee	A.W. Schultz		913-307-0399	smcghee@awschultzinc.com
5.	Curtis Porter	Innovative Werks, Inc		312-584-9039	cporter@innovativewerks.com
6.	Albright, Phil	EGS		918-281-5025	phil.albright@englobal.com
7.	Parker, Herbert	KC Water	4800 E. 63 rd St. Kansas City, MO 64130	816-729-4727	Herbert.Parker@kcmo.org
8.	Walton, Leona	General Services	4800 E. 63 rd St. Kansas City, MO 64130		Leona.Walton@kcmo.org
9.	Kate Borkowski	CDW			katbork@cdw.com
10.	Miller, Jeff	Black & Veatch	11401 Lamar Ave, Overland Park, KS 66211	913-458-2393	MillerJS@bv.com

**Wastewater SCADA Improvements
Pre-Bid Conference**

	NAME	COMPANY NAME	ADDRESS	PHONE	EMAIL
11.	Andrew Richardson	MegaKC Corporation			arichardson@megakc.com
12.	Boley, Trey	Black & Veatch	8400 Ward Parkway, Kansas City, MO 64114	913-458-7244	BoleyT@bv.com
13.	Kamerzell, Maryam (Mary)	Black & Veatch	8400 Ward Parkway, Kansas City, MO 64114	913-458-3357	KamerzellMK@bv.com
14.	Ricks, Julia	Black & Veatch	11401 Lamar Ave, Overland Park, KS 66211	913-458-3831	RicksJ@bv.com
15.	Ross, Morris	KC Water	4800 E. 63 rd St. Kansas City, MO 64130		Morris.Ross@kcmo.org
16.	Broyles, Chris	EGS			chris.broyles@englobal.com
17.	Colton Pogue	National Trench Safety			coltonpogue@ntsafety.com
18.	Anderson, Blake	KC Water	4800 E. 63 rd St. Kansas City, MO 64130	816-513-0329	Blake.W.Anderson@kcmo.org
19.	Robinson, Carey	KC Water	7300 Hawthorne Road Kansas City, MO 64120	816-513-7243	Carey.Robinson@kcmo.org
20.	Herring, Brent	KC Water	7300 Hawthorne Road Kansas City, MO 64120	816-513-7241	Brent.Herring@kcmo.org
21.	Nick Clemons	Mark One		816-213-5900	nick.clemons@markone.com
22.	Mike Biehl	Graybar			Michael.Biehl@graybar.com

**Wastewater SCADA Improvements
Pre-Bid Conference**

	NAME	COMPANY NAME	ADDRESS	PHONE	EMAIL
23.	Landis, Larry	EGS			larry.landis@englobal.com
24.	Joe Yager	Goodwin Brothers Construction			jyager@goodwinbros.com
25.					
26.					
27.					
28.					
29.					
30.					
31.					
32.					
33.					
34.					

BUILDING A WORLD OF DIFFERENCE

January 17, 2024

Wastewater SCADA Improvements Phase 2 Pre-Bid Conference

BUILDING A WORLD OF DIFFERENCE®
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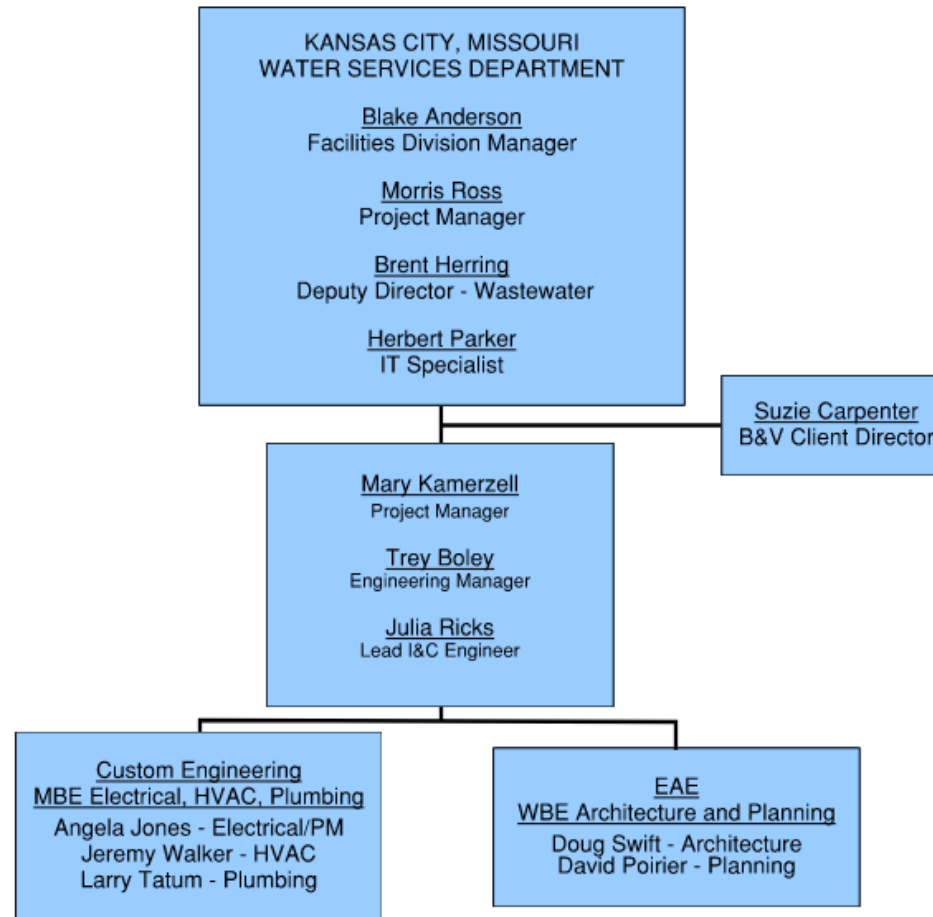


Agenda

- **Introductions and Project Overview**
- **Considerations and Submission of Bids**
- **Project Description and Sample Drawings**
 - SCADA (PLC upgrades, Communication, Electrical)
 - Control Rooms (Architectural, HVAC, Plumbing, Electrical)
 - Permitting for Fiber (Levee, Railroad, MODOT)
- **Project Requirements**
- **Q&A**

Please place contact name, company, and email in Teams chat for attendance

Team Organization Chart



Bidding Requirements

- Bid Opening: February 13, 2024 @ 2 p.m.
- Award is based on the Lump Sum Base Bid
- Provide unit price bid items as shown in the Bid Form
- Two-year correction period
- 15% MBE/14% WBE Participation Required
- Prevailing Wage Rates for three counties
- Tax Exemption
- Not Federally funded

Site Visits and Questions

- Site visits will be held the week of January 29
- A selection of sites that are representative of others or are unique cases has already been made
- Additional sites may be requested no later than 5pm Monday January 22
- Final site visit schedule will be provided via addendum
- Submit all questions via email to David Elge and Morris Ross (technical) or Leona Walton (contracting)
- Questions received less than 7 days prior to the date for opening of Bids may not be answered



Items to be Submitted with the Bid

On Bid Day:

- Bid Form (Section 00410)
- Experience and Reference Summary (Section 00410.01)
- Experience and Reference Summary-Current Projects (Section 00410.02)
- List of Equipment and Staffing Available for Project (Section 00410.03)
- Unit Prices (Section 00412)
- Allowance Form (Section 00413)
- Bid Bond (Section 00430) (5% of Bid)
- Evidence of Competency to Perform (Section 00210 paragraph 3 items b – f). No prescribed format provided.

48 Hours After Bid Opening

- Contractor Utilization Plan/Request for Waiver (Section 00450, CREO KC Form 8)
- Letter of Intent to Subcontract (Section 000450.01) for each MBE/WBE subcontractor.
- Project Bonds - Bid Bond, Performance and Maintenance Bond, Payment Bond (Sections 00430, 00610, 00615).

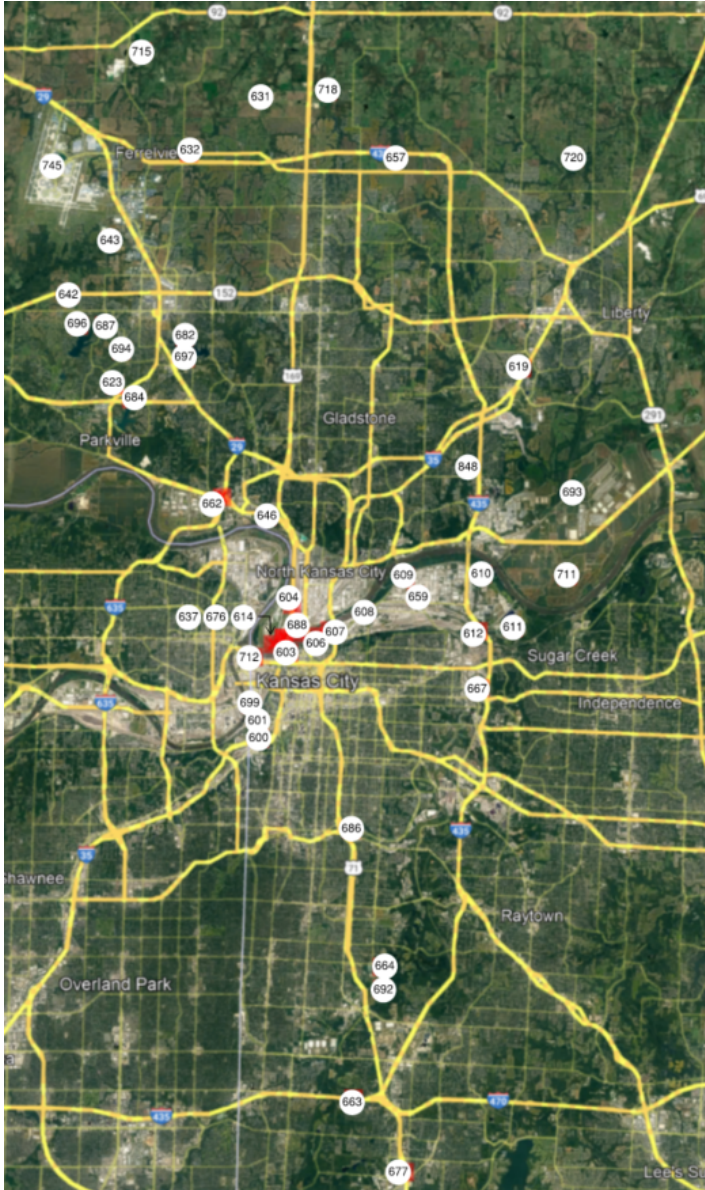
FRONT END DOCUMENTS* REFERENCED

- Bid Form and Misc Forms (Section 00410, 00410.01, 00410.02, 00410.03)
- Unit Prices (Section 00412)
- Allowance Form (Section 00413)
- Bid Bond (Section 00430)
- Instructions to Bidders (Section 00210)
- 48-Hour Submission (Section 00440, CREO KC Form 5 Instruction)
- Contractor Utilization Plan/Request for Waiver (Section 00450, CREO KC Form 8)
- Letter of Intent to Subcontract (Section 00450.01)
- Supplementary Conditions (Section 00800)
- Project Requirements (Section 01015)
- Submittal Procedures (Section 01300)
- Project Management and Coordination (Section 01310)
- Construction Progress Documentation (Section 01320)
- Photographic Documentation (Section 01380)
- Quality Control (Section 01400)

*not a complete list of Project Documents

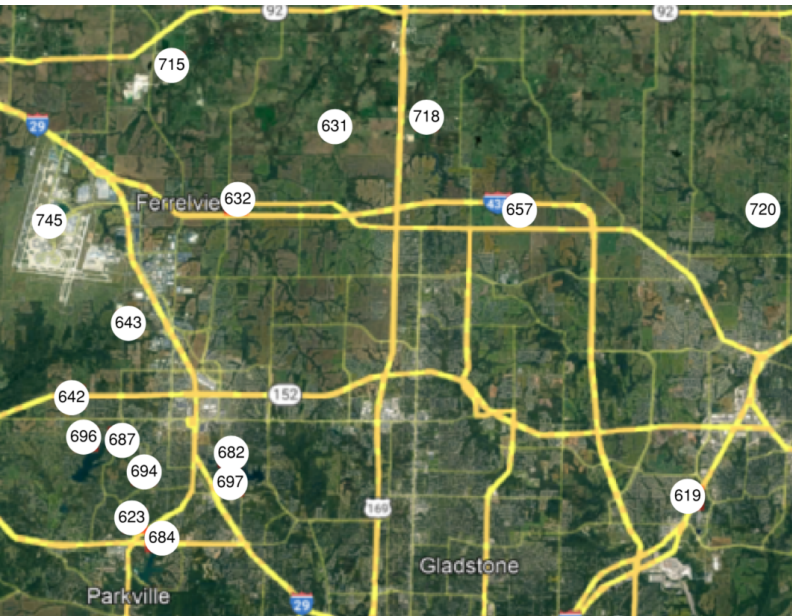


SITE LOCATIONS



- 5 WWTPs
- 25 Sanitary Stations
- 13 Flood Stations
- 1 Sanitary and Flood Station
- 1 Radio Tower

North Region

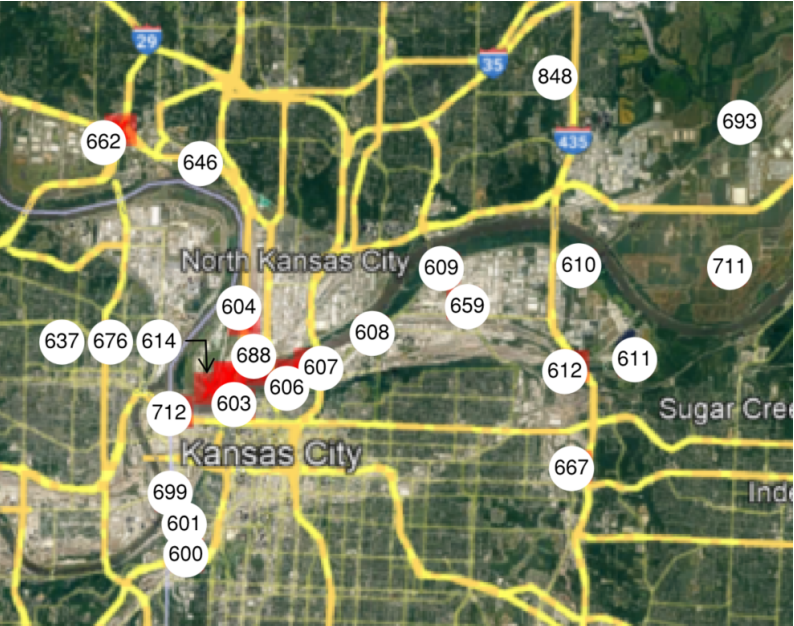


- 715 Todd Creek WWTP
- 631 First Creek Sanitary Station
- 718 Rocky Branch WWTP
- 745 KCI De-Icing Flood*
- 632 Second Creek Sanitary Station
- 657 Northland Mobile Sanitary Station
- 720 Fishing River WWTP
- 643 KCI Industrial Sanitary Station
- 642 Wildwood West Sanitary Station
- 696 Weatherby Lake Sanitary Station
- 687 Upper Rush Sanitary Station
- 694 Mace Road Sanitary Station
- 682 Lake Waukomis Sanitary Station
- 697 Platte Woods Sanitary Station
- 623 Pied Creek Sanitary Station
- 694 White Aloe Sanitary Station*
- 619 North Church Estates Sanitary Station

* Site visit scheduled



Central Region



- 662 Riverside Horizons Sanitary Station*
- 646 Briarcliff West Sanitary Station*
- 604 North Airport Flood Station
- 614 South Airport Flood Station
- 637 South Airport Relief Flood Station*
- 676 South Air Pumping Sanitary Station*
- 699 Kemper Flood Sanitary Station
- 601 25th Street Flood Station
- 600 Southwest Boulevard Sanitary and Flood Station
- 712 Westside WWTP*
- 603 Broadway Flood Station
- 688 Harlem Sanitary Station
- 606 Gillis Flood Station*
- 607 Lydia Flood Station
- 608 Prospect Flood Station
- 659 Chouteau Sanitary Station
- 609 Milwaukee Flood Station
- 610 Truman Flood Station
- 611 Hawthorn Flood Station
- 612 Blue Bank Flood Station*
- 667 12th Street Sanitary Station
- 711 Birmingham WWTP*
- 693 Birmingham Sanitary Station*
- 848 East Tank Tower

* Site visit scheduled

South Region

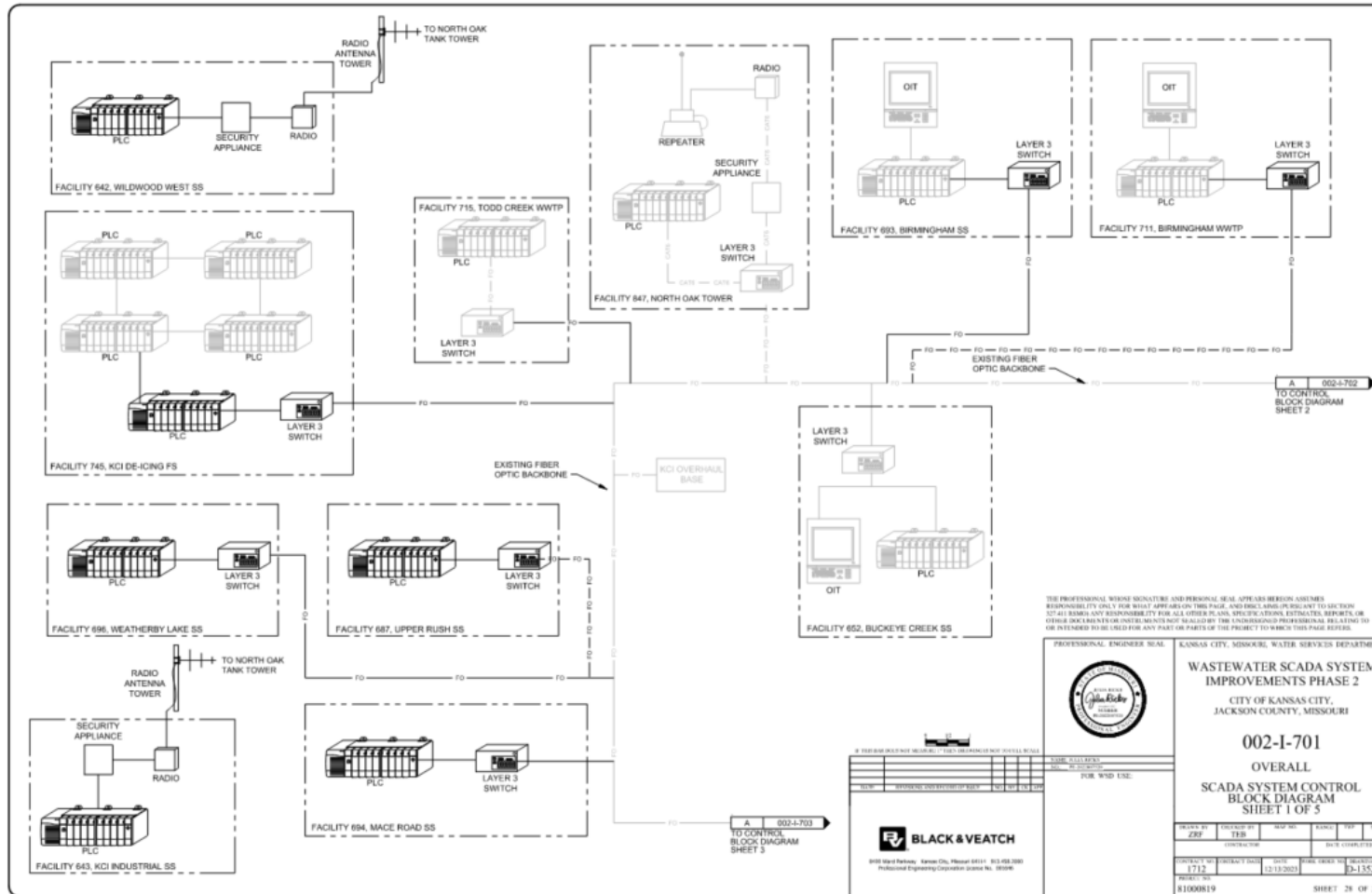
- 686 Brush Creek Sanitary Station
- 664 Gregory Ridge Sanitary Station
- 692 83rd Street Sanitary Station
- 663 Birchwood Sanitary Station
- 677 118th and Lawndale Sanitary Station



System Suppliers

- Three named firms:
 - R.E. Pedrotti Company
 - Integrated Controls
 - Durkin, Inc.

OVERALL CONTROL SYSTEM BLOCK DIAGRAM



- High level (not all equipment shown)
- Spread out across five sheets to encompass all facilities

THE PROFESSIONAL ENGINEER'S SIGNATURE AND PERSONAL SEAL APPEARS HEREON ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DOES NOT ASSUME RESPONSIBILITY FOR ANY OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT ISSUED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR REFERRED TO BE USED FOR ANY PART OR PARTS OF THIS PROJECT TO WHICH THIS PAGE REFERS.

PROFESSIONAL ENGINEER SEAL

KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT

WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2

CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI

002-I-701

OVERALL SCADA SYSTEM CONTROL BLOCK DIAGRAM SHEET 1 OF 5

DESIGN BY	CHECKED BY	DATE	SCALE	DATE
ZRF	YES			

CONTRACT NO. 1712 DATE 12-13-2013 SHEET NO. 8-1352-05

PROJECT NO. R1000R19 SHEET 28 OF 311

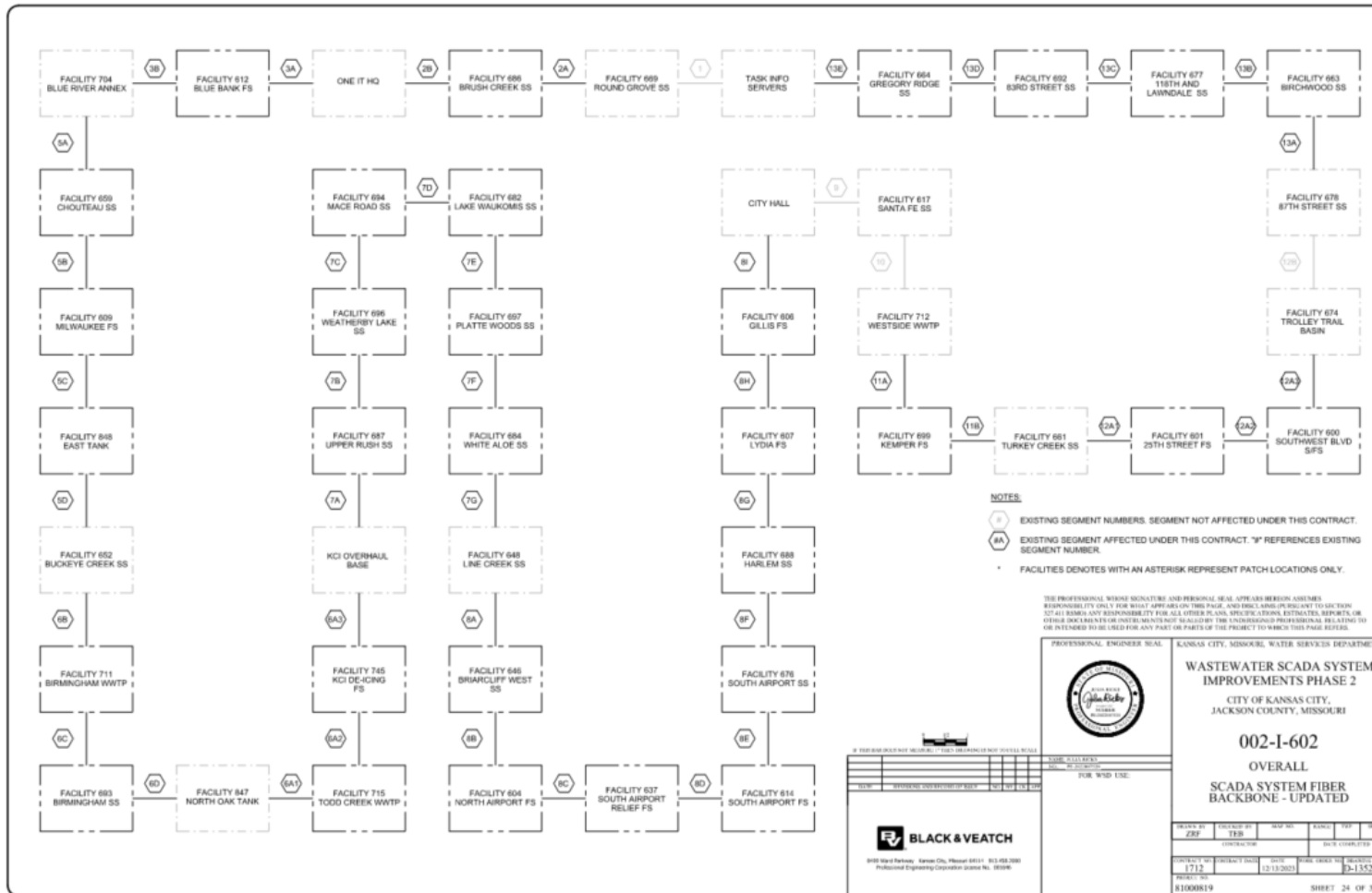
BLACK & VEATCH

8100 Ward Parkway, Suite 200, Kansas City, MO 64114

Professional Engineering Corporation License No. 000000



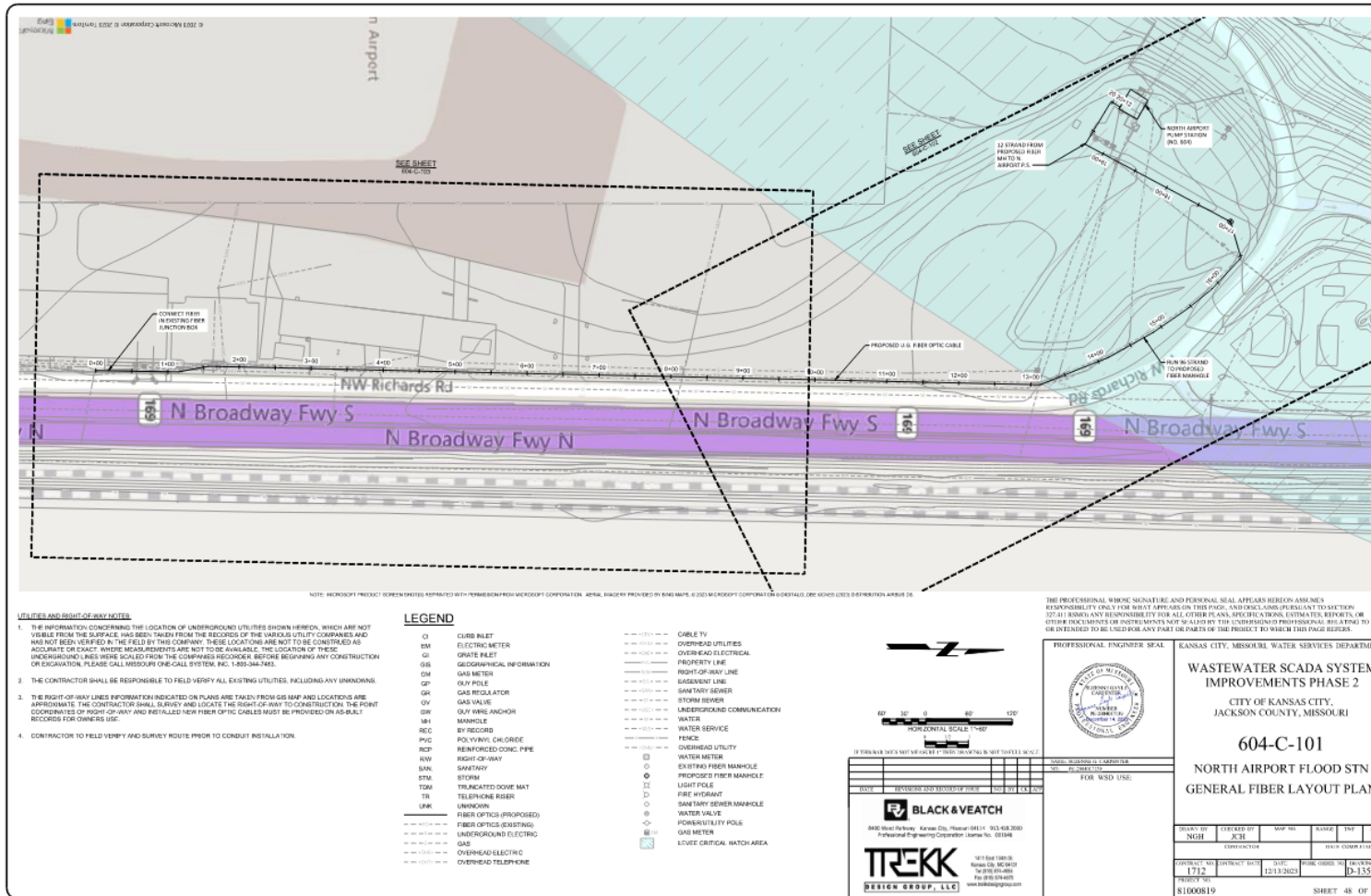
OVERALL FIBER BACKBONE DIAGRAM



- High level (not all equipment shown)
- Phase 1 (completed) and Phase 2 sites shown
- More detailed and spread out across three sheets also included



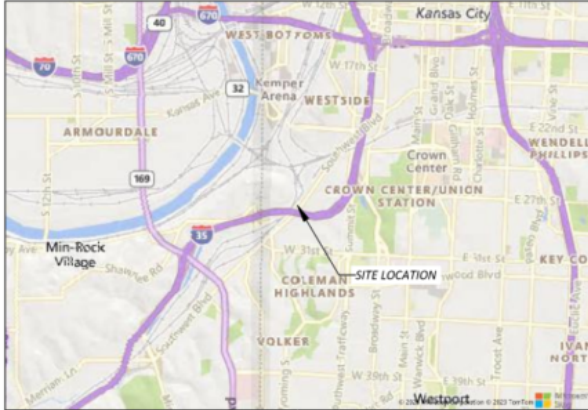
FACILITY FIBER LAYOUT(S)



- Only for sites where fiber is being installed
- May include a general fiber layout plan (shown) for the whole path, followed by more detailed portions of the path



FACILITY SITE PLAN AND VICINITY MAP



VICINITY MAP

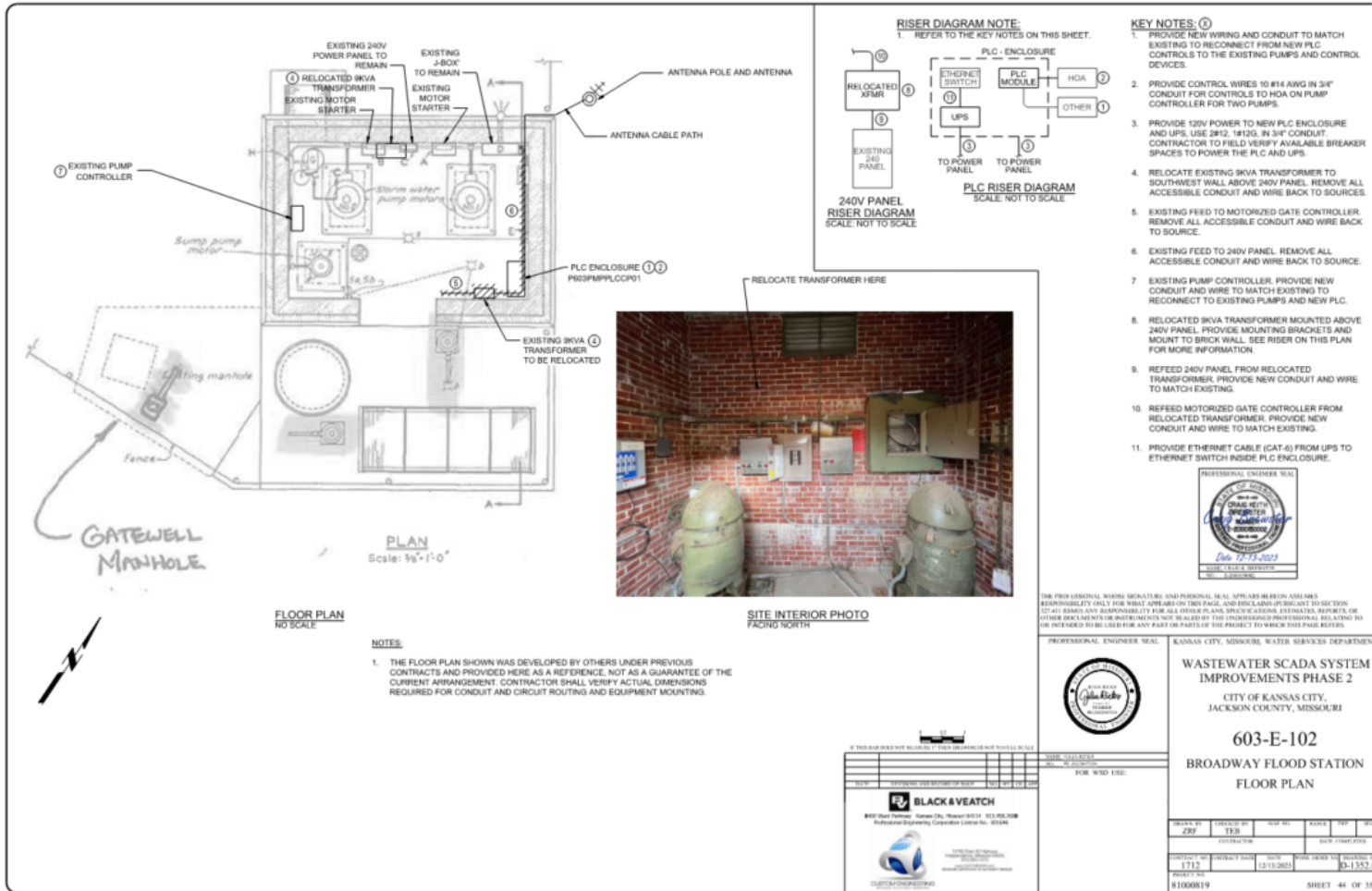
HORIZONTAL SCALE 1"=50'

THE PROFESSIONAL ENGINEER'S SEAL AND PERSONAL SEAL APPLIES IN REGARDS ASSUMES RESPONSIBILITY ONLY FOR THIS DRAWING ON THIS PAGE, AND THE ENGINEER IS NOT TO BE HELD RESPONSIBLE FOR ANY OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE ENGINEER OR PROFESSIONAL SEALING BOARD OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

	<p>KANSAS CITY, MISSOURI WATER SERVICES DEPARTMENT</p> <p>WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2</p> <p>CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI</p> <p>600-E-101</p> <p>SOUTHWEST BLVD S & FL STN</p> <p>SITE PLAN</p>																				
<p>Environmental Advisors and Engineers, Inc. 10011 Overland Terrace Overland, MO 64119 TEL: 913.286.4000</p>	<table border="1" style="width: 100%; border-collapse: collapse; font-size: 8px;"> <tr> <td>PROJECT NO.</td> <td>DATE</td> <td>SCALE</td> <td>PROJECT</td> </tr> <tr> <td>R1000019</td> <td>12/19/2023</td> <td>1"=150'</td> <td>P-1353.03</td> </tr> <tr> <td colspan="2">DRAWN BY CJW</td> <td>CHECKED BY DSP</td> <td>DATE COMPLETED</td> </tr> <tr> <td colspan="2">PROJECT TITLE</td> <td>PROJECT NO.</td> <td>SHEET NO.</td> </tr> <tr> <td colspan="2">WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2</td> <td>R1000019</td> <td>34 OF 35</td> </tr> </table>	PROJECT NO.	DATE	SCALE	PROJECT	R1000019	12/19/2023	1"=150'	P-1353.03	DRAWN BY CJW		CHECKED BY DSP	DATE COMPLETED	PROJECT TITLE		PROJECT NO.	SHEET NO.	WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2		R1000019	34 OF 35
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R1000019	12/19/2023	1"=150'	P-1353.03																		
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WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2		R1000019	34 OF 35																		



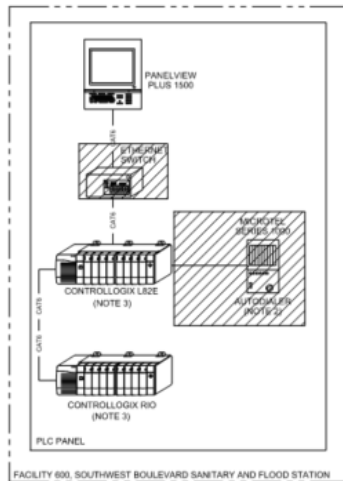
FACILITY FLOOR PLAN



- May include preexisting floor plan, site photos, or both
- Riser diagrams provided on these sheets

FACILITY CONTROL SYSTEM BLOCK DIAGRAM – DEMO/NEW WORK

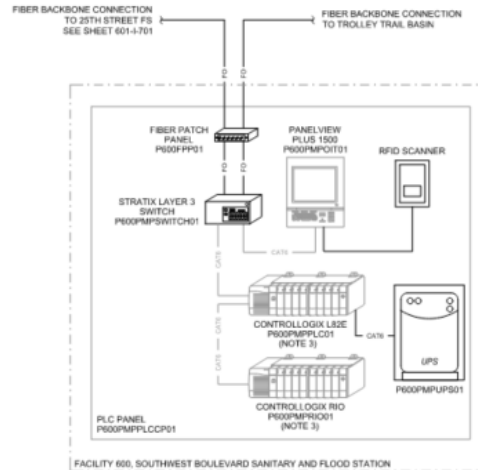
- Highest level of detail (compared to Overall Control System Block Diagram and Overall Fiber Diagram)



DEMO NOTES:

1. ALL EQUIPMENT ON THIS DEPICTION IS EXISTING. SOLID LINEWORK IS SHOWN FOR CLARITY.
2. AUTOVALER CURRENTLY NOT IN OPERATION.
3. AT THE TIME THESE DRAWINGS ARE BEING ISSUED, A SLC 505 IS IN PLACE (SEE 600-E-801). A CONTROLLOGIX PLC AND RIO ARE TO BE INSTALLED BY OTHERS UNDER ANOTHER CONTRACT.

DEMO



NEW WORK NOTES:

1. SEE INSTRUMENTATION AND CONTROL SYSTEM SPECIFICATION SECTION FOR DETAILED DESCRIPTIONS OF SCOPE OF WORK.
2. FIBER IS SINGLE MODE UNLESS OTHERWISE NOTED.
3. CONTROLLOGIX PLC AND RIO TO BE INSTALLED BY OTHERS UNDER ANOTHER CONTRACT.

NEW WORK

THE PROFESSIONAL ENGINEER'S SEAL AND PERSONAL SEAL APPLIES HEREON ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS RESPONSIBILITY TO THE EXTENT PERMITTED BY LAW FOR ANY OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT RELEASED BY THE UNDERSIGNED PROFESSIONAL RELATIVES TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE RELATES.

KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT

WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2
CITY OF KANSAS CITY,
JACKSON COUNTY, MISSOURI

600-I-701

SOUTHWEST BLVD S & FL STN
CONTROL SYSTEM BLOCK
DIAGRAM - DEMO/NEW WORK

IF THESE DIMENSIONS DO NOT MATCH THE DIMENSIONS NOTED BY THE CONTRACTOR, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CORRECTION.

NO.	REVISION	DATE	BY	CHKD BY



9880 Ward Parkway, Kansas City, Missouri 64114 816.432.2800
Professional Engineering/Construction License No. 001836

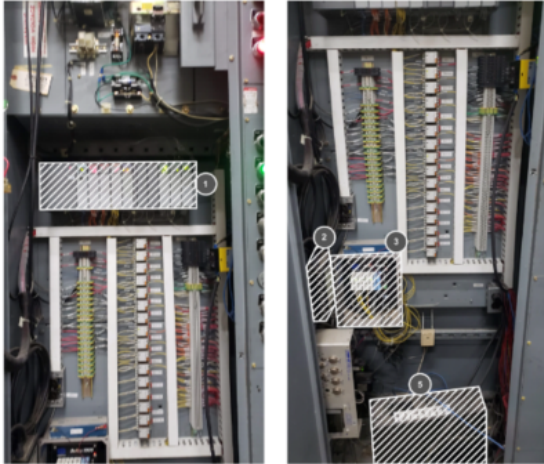
		KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2 CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI 600-I-701 SOUTHWEST BLVD S & FL STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	
DRAWN BY AWR	CHECKED BY TEB	DATE 12/11/2021	SHEET NO. 2-1353.03
PROJECT NO. 1712		CONTRACT NO. 12112021	SHEET TOTAL 2-1353.03
PROJECT NO. 81000819		SHEET NO. OF 331	



FACILITY DEMO/NEW WORK PHOTOS

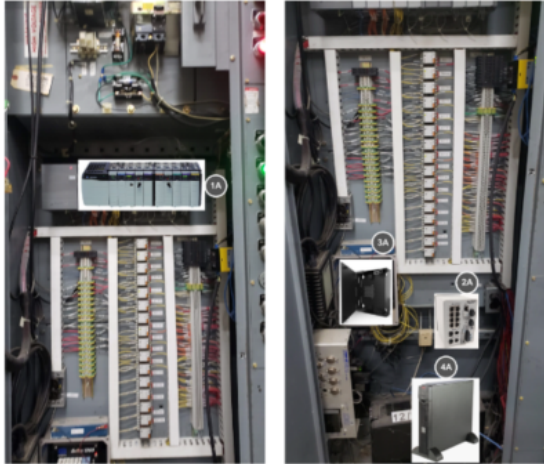


ANTENNA ENCLOSURE - DEMO



PLC ENCLOSURE - DEMO
(P614MPPLCCP01)

- 1 - SLC 505 PLC
- 2 - MDS RADIO
- 3 - AUTODIALER
- 4 - YAGI ANTENNA
- 5 - UPS



PLC ENCLOSURE - NEW WORK
(P614MPPLCCP01)

- 1A - CONTROLLOGIX PLC
- 2A - STRATIX LAYER 3 SWITCH
- 3A - FIBER PATCH PANEL
- 4A - UPS

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DEMO NOTES:

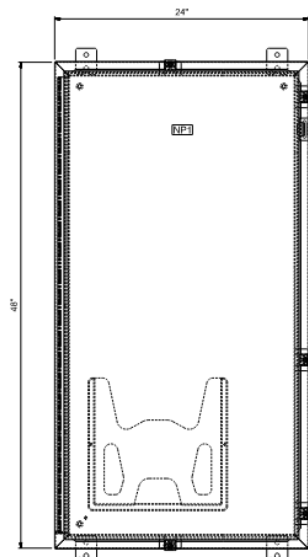
- DEMO SHALL INCLUDE REMOVAL OF DENOTED ITEMS AND POWER SUPPLY WIRING TO THE DEVICES.
- CONTRACTOR SHALL SALVAGE ALL DEMO'D ITEMS TO THE OWNER. SALVAGED COMPONENTS SHALL BE PRESERVED AND PROTECTED FROM PHYSICAL DAMAGE AND THE WEATHER UNTIL BEING TURNED OVER TO THE OWNER. SEE INSTRUMENTATION AND CONTROL SYSTEM SPECIFICATION SECTION FOR ADDITIONAL SALVAGE REQUIREMENTS.

NEW WORK NOTES:

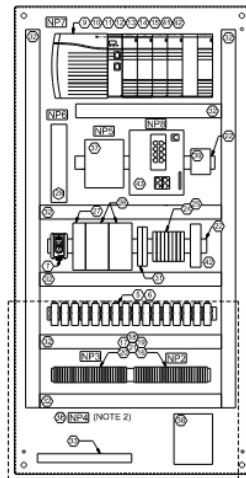
- INSTALL NEW ETHERNET SWITCH ON NEW DIN-RAIL ATTACHED TO BACKPANEL.
- INSTALL NEW CAT6 JUMPERS BETWEEN NEW SWITCH AND PLC ETHERNET PORT AND OIT.
- PROVIDE NEW FIBER OPTIC JUMPERS BETWEEN FIBER PATCH PANEL AND NEW ETHERNET SWITCH.

<p>PROFESSIONAL ENGINEER SEAL</p>		<p>KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT</p> <p>WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2</p> <p>CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI</p> <p>614-I-901</p> <p>SOUTH AIRPORT FLOOD STN DEMO/NEW WORK PHOTOS</p>	
<p>DATE: 12/11/2021</p> <p>TIME: 10:00 AM</p> <p>PROJECT NO: K180001-9</p> <p>SHEET 106 OF 151</p>		<p>REVISION BY: ZRP</p> <p>DATE: 12/11/2021</p> <p>BY: TJB</p> <p>DATE: 12/11/2021</p> <p>FOR WORK USE:</p>	

FACILITY NEW PANEL LAYOUT



P603PMPPLCCP01 EXTERIOR LAYOUT
NO SCALE



P603PMPPLCCP01 INTERIOR LAYOUT
NO SCALE

NAMEPLATE SCHEDULE	
ITEM	TEXT
NP1	P603PMPPLCCP01
NP2	DISCRETE TB
NP3	ANALOG TB
NP4	UPS
NP5	SECURITY APPLIANCE
NP6	RADIO
NP7	P603PMPPLCCP01
NP8	LAYER 2 ETHERNET SWITCH

ITEM LIST	
ITEM	DESCRIPTION
1	WALL-MOUNT, ONE-DOOR, SINGLE ACCESS, 48"X24"X16" NEMA 4X ENCLOSURE
2	BACK PANEL
3	SIDE PANEL
4	LED LIGHT (ACTIVATED BY DOOR SWITCH)
5	RELAY
6	RELAY SOCKET
7	GFCI RECEPTACLE
8	DOOR STOP KIT
9	ALLEN BRADLEY CONTROLLOGIX CHASSIS
10	PLC POWER SUPPLY
11	ALLEN BRADLEY CONTROLLOGIX PROCESSOR
12	ANALOG INPUT MODULE
13	DIGITAL AC INPUT MODULE
14	DIGITAL AC OUTPUT MODULE
15	SLOT FILLER
16	KNIFE DISCONNECT

ITEM LIST	
ITEM	DESCRIPTION
17	TERMINAL BLOCK, DIN RAIL MOUNT
18	GROUND TERMINAL BLOCK
19	END PLATE TERMINAL BLOCK
20	LABEL STRIP
21	END CLAMP TERMINAL BLOCK
22	DIN RAIL
23	FUSE HOLDER LABELS
24	FUSE HOLDER
25	FUSE
26	AC/DC POWER SUPPLY
27	POWER SUPPLY REDUNDANCY MODULE
28	RF4 APRISA SR+ 220MHZ RADIO
29	PTC RESETTABLE OVERCURRENT DEVICE
30	DISCONNECT TERMINAL BLOCK
31	SURGE PROTECTOR
32	PLASTIC WIRING DUCT WITH COVER
33	COPPER GROUND BAR KIT
34	REMOVABLE TERMINAL BLOCK
35	CAGE-CLAMP REMOVABLE TERMINAL BLOCK
36	UNINTERRUPTIBLE POWER SUPPLY
37	SECURITY APPLIANCE
38	PANEL HEATER
39	THERMOSTAT
40	RADIO ANTENNA SURGE PROTECTOR
41	MODBUS MODULE
42	DNP3 SLAVE GATEWAY MODULE
43	LAYER 2 INDUSTRIAL ETHERNET SWITCH

- NOTES:**
- COMPONENTS ARE SHOWN TO PROVIDE A GENERAL GUIDE ON PANEL LAYOUT AND DO NOT REFLECT EVERY COMPONENT NECESSARY FOR A COMPLETE INSTALLATION. CONTRACTOR SHALL PROVIDE ADDITIONAL COMPONENTS AS NECESSARY FOR A COMPLETE INSTALLATION.
 - UNINTERRUPTIBLE POWER SUPPLY SHALL BE INSTALLED IN RESERVED SPACE AS SHOWN.
 - RADIO ANTENNA SURGE SUPPRESSOR SHALL BE BULKHEAD-MOUNTED AND INSTALLED ON THE SIDE PANEL.
 - PANEL SHALL BE STRUT CHANNEL MOUNTED IN THE LOCATION SHOWN ON THE FACILITY'S FLOOR PLAN.

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS HEREON ASSUMES RESPONSIBILITY ONLY FOR BEST APPEARS ON THIS PAGE, AND DISCLAIMS LIABILITY TO SECTION 337.41 (KSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE SIGNING PROFESSIONAL, BEING MADE OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE RELATES.

PROFESSIONAL ENGINEER SEAL

KANSAS CITY, MISSOURI WATER SERVICES DEPARTMENT
WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2
 CITY OF KANSAS CITY,
 JACKSON COUNTY, MISSOURI
603-I-902
BROADWAY FLOOD STATION
CONTROL PANEL LAYOUT

DESIGNED BY ATS	CHECKED BY TEB	DATE 12/11/2023	SCALE AS SHOWN	SHEET NO. 47	TOTAL SHEETS 131
APPROVED BY S1000819		DATE 12/11/2023			

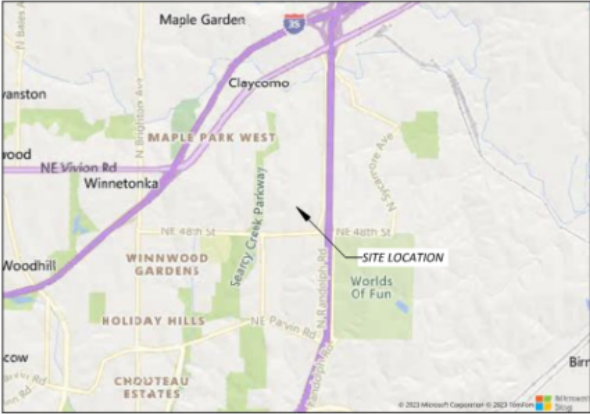
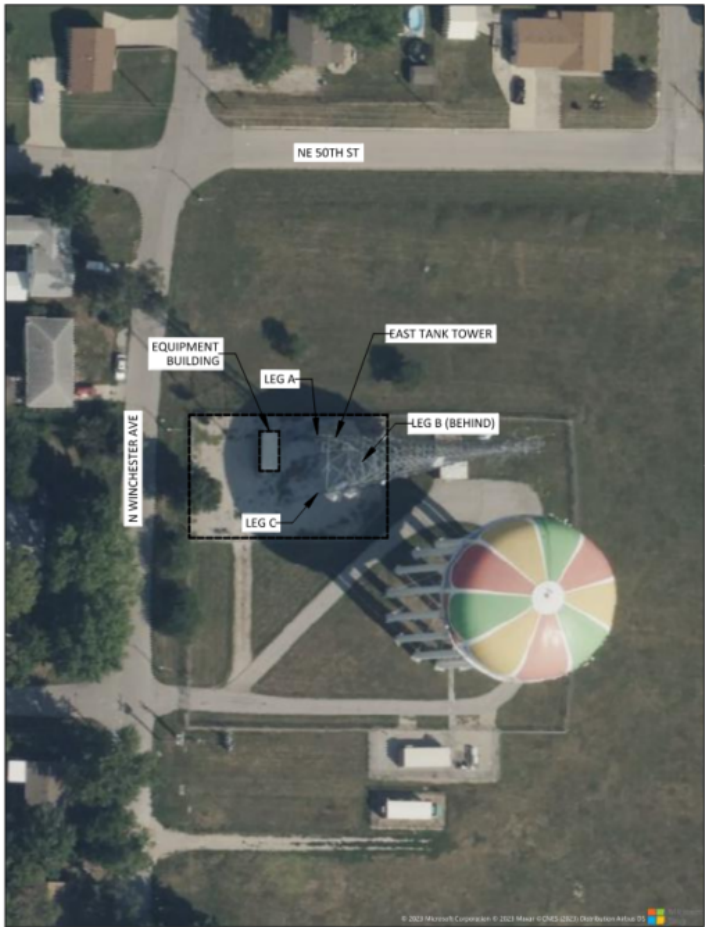
PROJECT NO. 1712
 SHEET 47 OF 131

BLACK & VEATCH

180 West Broadway, Kansas City, Missouri 64101, 816.433.2000
 Professional Engineering Corporation License No. 00546

- Only for sites where a new panel is required
- Control panels (include PLCs) and communication panels (include radio or fiber patch panel)

EAST TANK TOWER MASTER RADIO



VICINITY MAP

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PROFESSIONAL ENGINEER SEAL:

KANSAS CITY, MISSOURI WATER SERVICES DEPARTMENT
WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2
 CITY OF KANSAS CITY,
 JACKSON COUNTY, MISSOURI

848-E-101
EAST TANK TOWER
SITE PLAN

PROJECT NO.	CONTRACT NO.	DATE	FILE NUMBER	ISSUANCE NO.
81000819	1712	12/13/2023	D-1552-03	

SHEET 345 OF 351

- Installation of master radio in KCPD equipment building and pre-purchased antenna on KCPD tower
- Some radio sites will communicate with this master, others with the existing master radio at the North Oak Tank

Collaboration

- **Many sites will be impacted by work being performed by others under separate contracts.**
- **Open communication and proactive collaboration will be critical for making this project a success.**

Site	Description of other work
Facility 600, Southwest Boulevard Sanitary and Flood Station	replacing SLC with ControlLogix
Facility 601, 25 th Street Flood Station	replacing SLC with ControlLogix
Facility 606, Gillis Flood Station	installing fiber along Riverfront Heritage Trail
Facility 607, Lydia Flood Station	installing fiber along Riverfront Heritage Trail
Facility 614, South Airport Flood Station	installing conduit for fiber along NW Lou Holland Drive as shown on drawings
Facility 637, South Airport Relief Flood Station	installing conduit for fiber along NW Lou Holland Drive as shown on drawings
Facility 664, Gregory Ridge Sanitary Station	complete site commissioning and turn operation over to KCMO WSD; installing conduit for fiber along 75 th Street and more as shown on drawings
Facility 676, South Air Pumping Sanitary Station	installing conduit for fiber along NW Lou Holland Drive as shown on drawings
Facility 687, Upper Rush Sanitary Station	designing and constructing the new facility
Facility 696, Weatherby Lake Sanitary Station	designing and constructing the new facility
Facility 711, Birmingham WWTP	installing on-site fiber
Facility 715, Todd Creek WWTP	designing and constructing the new facility



WWTP CONTROL ROOM UPGRADES

2 BIRMINGHAM-FLOOR PLAN

PLAN KEY NOTES:

- EXISTING WALL OPENINGS AND DAMAGE TO BE FILLED FLUSH WITH MORTAR, AND PAINTED.
- INSTALL EXISTING WALL MOUNTED FIRE EXTINGUISHER.
- WORK STATION WITH MONITORS (OWNER FURNISH, OWNER INSTALLED (OFCL).
- PAINT ALL ITEMS AT ELEVATION 10'-4" AND ABOVE BLACK INCLUDING DUCTWORK, CONDUITS, JUNCTION BOXES, PIPING STRUCTURE ETC. EXISTING DUCTS ABOVE TO BE PAINTED.
- EXISTING REFRIGERATOR TO BE REINSTALLED BY THE GC.
- EXISTING COFFEE CENTER CABINET TO BE INSTALLED BY THE OWNER.
- EXISTING CONCRETE FLOOR. PREPARE FOR, AND APPLY, RESINOUS FLOORING.
- EXISTING ICE MAKER TO BE INSTALLED BY THE GC.
- EXISTING A.D.A. DRINKING FOUNTAIN W/ BOTTLE FILLER TO REMAIN.
- EXISTING DESKTOP PRINTER (OFCL).
- RAISED FLOOR DRAIN TO BE FLUSH WITH THE RESINOUS FLOORING.
- EXISTING CLEANOUT TO BE RELOCATED. REFER TO THE PLUMBING DRAWINGS.
- EXISTING METAL CABINET (OFCL).
- EXISTING SAFE WITH NEW TREATED AND PAINTED WOOD SLEEPERS. GC TO INSTALL SLEEPERS WHICH ARE NOT TO EXTEND OUT BEYOND THE FRONT FEET BY MORE THAN AN INCH.
- EXISTING FIBER OPTIC BOARD. REFER TO ELECTRICAL DRAWINGS.
- NEW 72"x30" DESK AND OFFICE CHAIR (OFCL).
- NEW 60" OFFICE TABLE (OFCL).
- PLUMB. COUNTERTOP WITH WALL BRACES. REFER TO XXXXXX.
- PAINT ALL WALLS TO AN ELEVATION OF 10'-4" INCLUDING AREAS BEHIND THE REFRIGERATOR, ICE MAKER, WATER HEATER, CONDUITS AND PIPING.
- NEW WALL MOUNTED DIGITAL CLOCK. BOTTOM OF CLOCK TO BE 6'-4" A.F.F.
- PROVIDE NEW HM, DOOR AND FRAME WITH NEW HARDWARE.
- A.D.A. REQUIRED CLEAR FLOOR SPACE.
- EXISTING PLUMBING PIPES ON THIS WALL ARE TO REMAIN EXPOSED, REPAIR PIPE INSULATION WITH MATCHING INSULATION.
- PAINT ALL CONDUITS, BOXES AND PLUMBING. ITEMS UP TO ELEVATION 10'-4" ARE TO BE PAINTED TO MATCH THE WALL COLOR.
- PROVIDE THE ENCLOSURE FOR THE DOOR CLOSER MATCHING THE FINISH OF THE REMAINING ENCLOSURE.
- PROVIDE DOOR HARDWARE PER HARDWARE SET #2.
- EXISTING COAT TREE (OFCL).
- PROVIDE RESINOUS FLOORING WITH 6" INTEGRAL BASE WITH A TRANSITION STRIP AT THE 3' DOOR. RESINOUS FLOOR BASE TO EXTEND UP TO THE TOP OF THE FACE OF THE WATER HEATER EQUIPMENT PAD.
- PROVIDE WALL MOUNTED ILLUMINATED EXIT SIGN ABOVE DOOR.
- EXISTING UPPER PANEL TO BE RELOCATED. REFER TO ELECTRICAL PLANS.
- WALL MOUNTED IT CABINET. REFER TO THE ELECTRICAL DRAWINGS.
- MICROWAVE (OFCL). REFER TO ELECTRICAL DRAWINGS.
- PROVIDE CMU, FLASHING, INSULATION AND MATCHING EXTERIOR BRICK. REFER TO DETAIL A/XXXX.
- EXISTING WATER WELL PUMP AND ASSOCIATED JUNCTION BOXES. REFER TO PLUMBING DRAWINGS.
- NEW 20"x24" OFFICE TABLE (OFCL).

ARCHITECTURAL ABBREVIATIONS

ACP ACOUSTICAL CEILING PANELS
 AG ANGLE GUIDES
 ALLUM ALUMINUM
 CMU CONCRETE MASONRY UNIT
 CONC CONCRETE
 DBL DOUBLE
 DT DOUBLE TEE
 EP EPOXY
 EX EXISTING
 FRP FIBERGLASS REINFORCED PLASTIC
 GYP BD GYPSUM BOARD
 HM HOLLOW METAL
 INSUL INSULATION
 ISG INSULATED SAFETY GLASS
 MFR MANUFACTURER
 NA NOT APPLICABLE
 NW NO WORK
 OFCL OWNER FURNISHED CONTRACTOR INSTALLED
 OFCI OWNER FURNISHED OWNER INSTALLED
 OH CLG OVERHEAD COILING

ARCHITECTURAL ABBREVIATIONS CONT.

SCS SUSPENDED CEILING SYSTEM
 SC WD SOLID CORE WOOD DOOR
 SG SAFETY GLASS
 SS STAINLESS STEEL
 WAX WAX
 WG SAFETY GLASS
 VCT VINYL COMPOSITION TILE
 VWC VINYL WALL COVERING
 PT PAINT
 RB RUBBER
 RFS RUBBER FLOOR SYSTEM
 RS RESINOUS FLOORING

FINISH SCHEDULE

ROOM NO.	ROOM NAME	FLOOR	WALL												CEILING			REMARKS		
			EAST				WEST				NORTH				SOUTH				MATERIAL	FINISH
			MATERIAL	FINISH	MATERIAL	FINISH	BASE	MATERIAL	FINISH	BASE	MATERIAL	FINISH	BASE	MATERIAL	FINISH	BASE	MATERIAL	FINISH	HEIGHT	
1	CONTROL ROOM		CONC	RS	CMU	PT	RS	CMU	PT	RS	CMU	PT	RS	CMU	PT	RS	CMU	PT	RS	

DOOR SCHEDULE

DOOR NO.	DOOR SINGLE OR PAIR	WIDTH	HEIGHT	TYPE	MATERIAL	GLAZING	HWR SET	RATING	FRAME		REMARKS
									TYPE	MATERIAL	
1	SINGLE	3'-0"	7'-0"	D1	HM	SG	1	-	F1	HM	-
2	PAIR	4'-0"	7'-2"	D1	EX	NA	2	-	-	HM	-

PROFESSIONAL ARCHITECT SEAL

KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT

WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2

CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI

711CR-A-102

BIRMINGHAM WWTP CR

ARCHITECTURAL FLOOR PLAN AND SCHEDULES

DATE: 02/01/2017
 FOR 50% USE

EAE
 Environmental Address and Engineers, Inc.
 1975 Westgate Service
 Kansas, MO 66219
 TEL: 913.888.4900

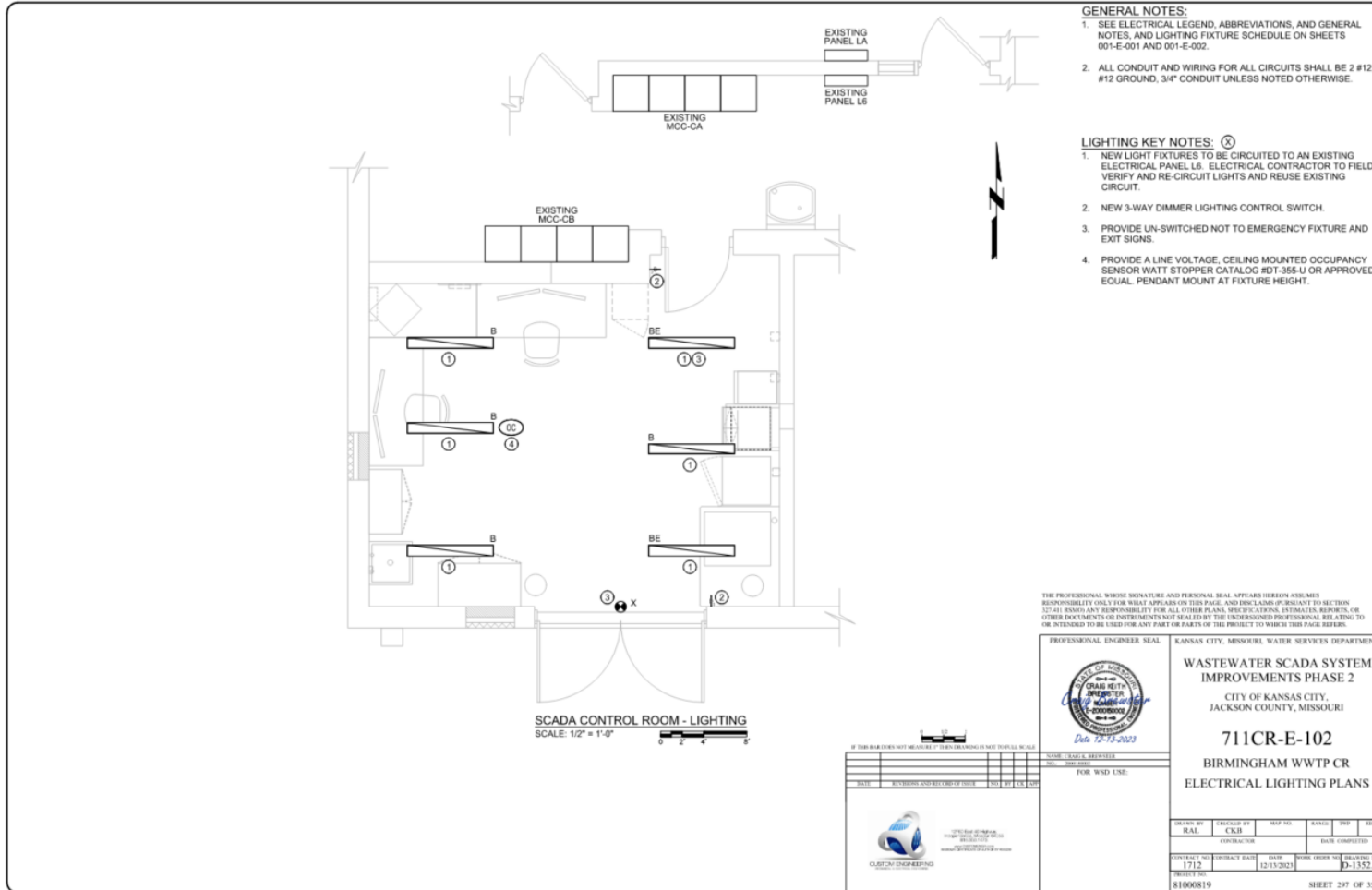
REVISIONS:

NO.	DESCRIPTION	DATE
1	ISSUED FOR PERMIT	02/01/2017

DESIGNED BY: JCF
 CHECKED BY: DCS
 DATE: 02/01/2017

PROJECT NO: 81000819
 SHEET 205 OF 351

WWTP CONTROL ROOM UPGRADES - LIGHTING



GENERAL NOTES:

1. SEE ELECTRICAL LEGEND, ABBREVIATIONS, AND GENERAL NOTES, AND LIGHTING FIXTURE SCHEDULE ON SHEETS 001-E-001 AND 001-E-002.
2. ALL CONDUIT AND WIRING FOR ALL CIRCUITS SHALL BE 2 #12, 1 #12 GROUND, 3/4" CONDUIT UNLESS NOTED OTHERWISE.

LIGHTING KEY NOTES: Ⓢ

1. NEW LIGHT FIXTURES TO BE CIRCUITED TO AN EXISTING ELECTRICAL PANEL L6. ELECTRICAL CONTRACTOR TO FIELD VERIFY AND RE-CIRCUIT LIGHTS AND REUSE EXISTING CIRCUIT.
2. NEW 3-WAY DIMMER LIGHTING CONTROL SWITCH.
3. PROVIDE UN-SWITCHED NOT TO EMERGENCY FIXTURE AND EXIT SIGNS.
4. PROVIDE A LINE VOLTAGE, CEILING MOUNTED OCCUPANCY SENSOR WATT STOPPER CATALOG #DT-355-U OR APPROVED EQUAL. PENDANT MOUNT AT FIXTURE HEIGHT.

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PROFESSIONAL ENGINEER SEAL		KANSAS CITY, MISSOURI WATER SERVICES DEPARTMENT	
		WASTEWATER SCADA SYSTEM IMPROVEMENTS PHASE 2 CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI	
		711CR-E-102 BIRMINGHAM WWTP CR ELECTRICAL LIGHTING PLANS	
DATE: 12/15/2023 NAME: CHAD RETHY NO.: 000000000 FOR WSD USE:		DESIGN BY: RAL CHECKED BY: CKJ CONTRACTOR:	SHEET NO.: SCALE: 1/2" = 1'-0" DATE COMPLETED:
CONTRACT NO.: 1712 CONTRACT DATE: 12/15/2023 SHEET NO.: 81000819		ORDER NO.: ORDER DATE: 12/15/2023 DRAWING NO.: DA-1352-03	SHEET 297 OF 351

IF THIS MARK DOES NOT MEASURE IN ACCORDANCE WITH THIS SCALE, SCALE IS VOID.

DATE	REVISION AND RECORD OF THIS	NO.	BY	CHK	DATE

CLUSTON ENGINEERING, INC.
 10000 N. W. 10th St., Suite 100, Oklahoma City, OK 73127
 www.clustonengineering.com



Permitting for Fiber (Levees)

FACILITY NAME	FACILITY CODE	Levee Unit	Levee Management
NORTH AIRPORT	604	NKC	NKC Levee District
GILLIS	606	East Bottoms	KCMO
LYDIA	607	East Bottoms	KCMO
MILWAUKEE	609	East Bottoms	KCMO
BLUE BANK	612	East Bottoms	KCMO
SOUTH AIRPORT	614	NKC	NKC Levee District
GREGORY RIDGE	618	Swope Park Ind Area	KCMO
SOUTH AIRPORT RELIEF	637	NKC	NKC Levee District
SOUTH AIR PUMPING	676	NKC	NKC Levee District
HARLEM	688	NKC	NKC Levee District
BIRMINGHAM PUMPING	693	Birmingham	Birmingham Drainage District
KEMPER	699	CID	KCMO
BIRMINGHAM WWTP	711	Birmingham	Birmingham Drainage District

Permitting for Fiber (Railroad & MODOT)

FACILITY NAME	FACILITY CODE	Railroad Coordination	MODOT Coordination
BIRMINGHAM PUMPING	693	X	
BIRMINGHAM WWTP	711		X

Project Requirements*

- Unit Prices Form
- Allowances
- Submit proposed “Or-Equal” items at least 11 days prior to Bid Date
- Existing Facilities must be kept in Continuous Operation
- See specifications for Shut-down and Sequencing Requirements
- Submittal Procedures
- Project Management and Coordination
- Construction Progress Documentation
- Quality Requirements
- RPR
- Substantial Completion: 1095 Calendar Days from NTP
 - \$5000 LDs
- Final Completion: 90 Days from SC
 - \$1000 LDs

*not a complete list of Project Requirements

Q&A



**Please remember to place your contact name,
company, and email in Teams chat for attendance**



BUILDING A WORLD OF DIFFERENCE

January 17, 2024

BUILDING A WORLD OF DIFFERENCE®
////////////////////



City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741

Pre-Bid Conference

AGENDA

Virtual Teams Meeting Participation
Wednesday, January 17, 2024 at 9:00 am

1. Introductions and Project Overview

- a. Project Team. City, Black & Veatch, and its consultants are shown on the graphic.
- b. Attendance Sign-in Sheet. Bids will not be accepted from any contractor whose company name is not on the sign-in sheet. Send e-mail to Chris Herrera verifying attendance. Include code phrase.
- c. Bid Opening – February 13, 2024, 2:00 p.m.
- d. Lump Sum Base Bid. Provide Unit Price items (Section 00412).
- e. Correction Period is two years (Section 00800, SC 13.07).
- f. Self-Performance and MBE/WBE Program Requirements. Minimum 15% MBE participation and 14% WBE participation (Section 00210, Article 19).
- g. Wage Rates for Platte, Jackson, and Clay Counties
- h. General Note. Bidders are responsible for being thoroughly familiar with the Bid Documents and site conditions. Only key parts of the documents will be reviewed today.

2. On-Site Inspections and Questions

- a. Site visits (week of 1/29), final schedule to be provided via Addendum:
 - a. Day 1:
 - (1) Facility 745, KCI De-Icing Flood Station (unique case, involves Aviation)
 - (2) Facility 684, White Aloe Sanitary Station (representative of outdoor sites with shared motor starter/PLC enclosure, most of which are elevated)
 - b. Day 2:
 - (1) Facility 662, Riverside Horizons Sanitary Station (unique case, additional vendor panel I/O back to PLC)
 - (2) Facility 646, Briarcliff West Sanitary Station (representative of outdoor sites with separate motor starter and PLC enclosures, SLC being replaced by ControlLogix, sites getting new communication panels, and sites with existing generators)
 - c. Day 3:
 - (1) Facility 637, South Airport Relief Flood Station (unique case, replacing level controller with new PLC, new enclosure required in small prefab building)
 - (2) Facility 676, South Air Pumping Sanitary Station (representative of sites with prefab buildings, SLC being replaced by ControlLogix)
 - (3) Facility 712, Westside WWTP (Control Room with HVAC work)
 - (4) Facility 606, Gillis Flood Station (representative of flood stations with level controllers being left in place to be monitored by new ControlLogix in new enclosure)

City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741
Pre-Bid Conference Agenda

- d. Day 4:
 - (1) Facility 612, Blue Bank Flood Station (site with MicroLogix being replaced by ControlLogix in new enclosure, some similarity to Facility 667, 12th Street Sanitary Station)
 - (2) Facility 711, Birmingham WWTP (Control Room with plumbing work, server, fiber to Switchgear building)
 - (3) Facility 693, Birmingham Sanitary Station (unique case with fiber path through multilevel building)
- e. Additional sites may be requested no later than 5pm Monday 1/22.
- b. Questions. Submit all questions via e-mail to David Elge and Morris Ross (technical questions), and Leona Walton (contracting questions) (Section 00210, Article 27).
- c. Questions received less than 7 days prior to the date for opening of Bids may not be answered (Section 00210, Article 27).

3. Considerations and Submission of Bids (Section 00210)

- a. Basis of Contract Award. City to determine lowest and best bid provided satisfactory evidence of Bidder's competency to perform work is submitted (Articles 2 and 3).
- b. Prevailing Wage (Article 17) and Certified Payroll Report (Section 00485).
- c. Taxes and MO Sales Tax Exemption (Section 00700, Article 6.11.C).
- d. Project is not federally funded.
- e. Selected Items to be Submitted with Bid
 - Bid Form (Section 00410)
 - Experience and Reference Summary (Section 00410.01)
 - Experience and Reference Summary-Current Projects (Section 00410.02)
 - List of Equipment and Staffing Available for Project (Section 00410.03)
 - Unit Prices (Section 00412)
 - Allowance Form (Section 00413)
 - Bid Bond (Section 00430)
 - Evidence of Competency to Perform (Section 00210.3 items b – f). No prescribed format provided.
- f. 48-Hour Submission (Section 00440, CREO KC Form 5 Instruction)
 - a. Contractor Utilization Plan/Request for Waiver (Section 00450, CREO KC Form 8)
 - b. Letter of Intent to Subcontract (Section 000450.01) for each MBE/WBE subcontractor.
- g. Project Bonds - Bid Bond, Performance and Maintenance Bond, Payment Bond (Sections 00430, 00610, 00615).

4. General Description of Project

- a. Description of Work (Section 01100, Article 1.02.C)
 - The work involves the installation of new equipment and software to establish a City-wide Wastewater SCADA System. Work descriptions included in the article

City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741
Pre-Bid Conference Agenda

for the following primary facilities

- (1) Fishing River WWTP
- (2) Rocky Branch WWTP
- (3) Westside WWTP
- (4) Birmingham WWTP
- (5) Todd Creek WWTP
- (6) Southwest Blvd S&FS
- (7) 25th Street FS
- (8) Broadway FS
- (9) North Airport FS
- (10) Gillis FS
- (11) Lydia FS
- (12) Prospect FS
- (13) Milwaukee FS
- (14) Truman FS
- (15) Hawthorn FS
- (16) Blue Bank FS
- (17) South Airport FS
- (18) North Church Estates SS
- (19) Pied Creek SS
- (20) First Creek SS
- (21) Second Creek SS
- (22) South Airport Relief FS
- (23) Wildwood West SS
- (24) KCI Industrial SS
- (25) Briarcliff West SS
- (26) Northland Mobile SS
- (27) Chouteau SS
- (28) Riverside Horizons SS
- (29) Birchwood SS
- (30) Gregory Ridge SS
- (31) 12th Street SS
- (32) South Air Pumping SS
- (33) 118th and Lawndale SS
- (34) Lake Waukomis SS
- (35) White Aloe SS
- (36) Brush Creek SS
- (37) Upper Rush SS
- (38) Harlem SS
- (39) 83rd Street SS
- (40) Birmingham SS
- (41) Mace Road SS
- (42) Weatherby Lake SS
- (43) Platte Woods SS

City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
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- (44) Kemper FS
- (45) KCI De-Icing FS
- (46) East Tank
- (47) Fiber Backbone

4. SCADA System

- a. Scope of Work described in specification Section 13500.
 - Three System Suppliers listed
- b. Overall SCADA Control System Block Diagram (Sheets 28-32, 002-I-701 through 002-I-705)
- c. Wastewater SCADA System Fiber Backbone Diagram (Sheet 24, 002-I-602)
- d. Drawing sets divided by facility as shown on the Drawing List (Sheets 2-4, 000-G-001 through 000-G-003) and as described in the Facility Codes shown on the Instrumentation and Control Legend Sheet (Sheet 9, 001-I-001).
- e. Facility sheet sets generally organized as follows:
 - General Fiber Layout Plan (example Sheet 48, 604-C-101) (N/A for radio sites).
 - If fiber run is long, Fiber Layout split into smaller sections immediately after General Fiber Layout Plan (example Sheets 49-50, 604-C-102 through 104)
 - Site Plan including Vicinity Map and Google Earth picture (example Sheet 34, 600-E-101) .
 - Floor or Building Plan (example Sheet 44, 603-E-102).
 - Control System Block Diagram Demo and New Work (example Sheet 36, 600-I-701) (Slide 18).
 - Demo and New Work Photos (example Sheet 100, 614-I-901) .
 - New Control Panel Layout (example Sheet 47, 603-I-902) .
 - East Tank Tower Master Radio (Sheet 345, 848-E-101) .

5. Ongoing Project Coordination

- a. Sites where work is being completed under separate contracts and will impact the work of this project :
 - Facility 600, Southwest Boulevard Sanitary and Flood Station (others replacing SLC with ControlLogix)
 - Facility 601, 25th Street Flood Station (others replacing SLC with ControlLogix)
 - Facility 606, Gillis Flood Station (others installing fiber along Riverfront Heritage Trail)
 - Facility 607, Lydia Flood Station (others installing fiber along Riverfront Heritage Trail)
 - Facility 614, South Airport Flood Station (others installing conduit for fiber along NW Lou Holland Drive and more as shown on drawings)

City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741
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- Facility 637, South Airport Relief Flood Station (others installing conduit for fiber along NW Lou Holland Drive and more as shown on drawings)
 - Facility 664, Gregory Ridge Sanitary Station (others to complete site commissioning and turn operation over to KCMO WSD, others installing conduit for fiber along 75th Street and more as shown on drawings)
 - Facility 676, South Air Pumping Sanitary Station (others installing conduit for fiber along NW Lou Holland Drive and more as shown on drawings)
 - Facility 687, Upper Rush Sanitary Station (others designing and constructing this facility)
 - Facility 696, Weatherby Lake Sanitary Station (others designing and constructing this facility)
 - Facility 711, Birmingham WWTP (others installing on-site fiber)
 - Facility 715, Todd Creek WWTP (others designing and constructing this facility)
- b. Open communication and proactive collaboration will be critical for making this project a success.

6. Control Room Upgrades (Architectural/HVAC/Plumbing)

- a. Facility sheet sets organized as follows:
- Architectural Floor Plan (example Sheet 295, 711CR-A-102)
 - Architectural Demo Plan (example Sheet 294, 711CR-A-101)
 - Electrical Lighting and Power Plan (example Sheet 306, 712CR-E-102)
 - Electrical Demo Plan (example Sheet 305, 712CR-E-101)
 - HVAC Plan (example Sheet 299, 711CR-H-101)
 - New reflected ceiling and lighting
 - Control room furniture to be provided by Owner

7. Permitting for Fiber

- a. Levees (Slide 25)
- b. Railroads (Slide 26)
- c. MODOT Right-of-way – 90 days from permit issuance to construction completion (Contractor responsibility)

8. Project Schedule

- a. Anticipated date of Notice to Proceed – April 2024
- b. Substantial Completion – 1,095 calendar days from NTP (Section 00800, SC 12.01.B.1)
- c. Final Completion – 90 calendar days from SC (Section 00800, SC 12.01.B.2)

9. 00412 – Unit Prices Form

- a. Unit price items listed here are not part of the Lump Sum Base Bid.

City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741
Pre-Bid Conference Agenda

10.00413 – Allowance Form

- a. Allowance for potential changes and for Rockwell Automation software.

11. Substitutes and "Or-Equal" Items (Section 00800, Article SC-6.06)

- a. Submit proposed "or-equal" items to City at least 11 days prior to Bid Date (Article SC-6.06.A.1).
- b. Proposed substitute items will only be considered after bidding (Article SC-6.06.A.2).

12. Project Requirements (Section 01015)

- a. Operation of Existing Facilities (Article 17)
 - Existing treatment plant must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from Owner in advance, in accordance with the Operational Change Control Plan (OCCP), portions of the existing facilities may be taken out of service for short periods as noted in the Construction and Schedule Requirements paragraphs.
 - Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities and processes in full operation during the construction period, except as noted in the Construction and Schedule Requirements paragraph.
- b. Construction and Schedule Requirements (Article 18)
 - Refer to Article 18 for a complete list of requirements.
 - All facilities must remain in operation during construction, except as noted in Articles 18 and 19.
 - Shutdown – maximum length of shutdown for WWTP must not exceed 1 hour from start to end of shutdown.
 - No shutdowns on consecutive days. Shutdowns on Tuesdays, Wednesdays or Thursdays preferred. Shutdowns to be on daytime weekdays, unless unavoidable. Prior notification must be provided to Owner for nighttime or weekend shutdowns.
 - Note the Owner advanced notification times for shutdowns.
 - Un-planned plant maintenance or treatment upset could delay Contractor's progress up to two (2) weeks. Contractor will be required to make up any lost time if critical to completion of the Work and shall include these two weeks allowance in the baseline schedule.
 - Contractor to submit OCCP for each anticipated shutdown (Section 01800)
- c. Proposed Construction Sequence (Article 19)
 - Refer to Article 19 for complete list of proposed sequencing.
 - Article 19 provides a suggested sequence for construction operations that

City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741
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shall be taken into consideration in preparing the Work Plan and proposed schedule of construction operations.

- d. Plans to be Developed by Contractor
 - Communication Plan (Article 32)
 - Project Safety Plan (Article 33)
 - Work Plan (Article 35)
- e. Fiber Backbone Construction Requirements
 - Fiber backbone work must conform to Public Works Design and Construction Standards as identified (Article 36).

13. Construction Progress Documentation (Section 01320)

- a. Submittals (Article 1.04)
 - Contractor's Construction Schedule – submit monthly with invoice

14. Photographic Documentation (Section 01380)

- a. Minimum of 50 pre-construction photographs.
- b. Minimum of 10 photographs with each monthly pay application.
- c. Minimum of 50 post-construction photographs.

15. Resident Project Representative (RPR)

- a. Part-time RPR will be provided.
- b. Duties, Responsibilities, and Limitations of Authority will be provided to Contractor prior to pre-construction conference.

16. Liquidated Damages (Section 00800, Article 12.01)

- a. Substantial Completion, \$5,000.00/day (Article SC-12.01.C.1)
- b. Final Completion, \$1,000.00/day (Article SC-12.01.C.2)

17. Addenda and Pre-Bid Meeting Summary Notes

- a. To be issued through KCMO plan room.
- b. Pre-Bid conference meeting notes and sign-in sheet will be attached via Addendum for information only.

18. Questions and Answers

City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741

Pre-Bid Site Visits
SCHEDULE

Please note that many of the addresses listed are approximations and the actual facility location may be nearby, without a precise address. It is strongly recommended that anyone visiting these facilities refer to the site plan Drawings before traveling to the facilities.

Day 1: Monday January 29, 2024 at 9am	
Facility	Location
745, KCI De-Icing Flood Station	250 Paris St, Kansas City, MO 64153
684, White Aloe Sanitary Station	6510 NW Platte Hills Rd, Kansas City, MO 64152

Day 2: Tuesday January 30, 2024 at 8:30am	
Facility	Location
662, Riverside Horizons Sanitary Station	4400 NW 41 st St, Riverside, MO 64150
646, Briarcliff West Sanitary Station	1601 NW Tullison Rd, Kansas City, MO 64150

Day 3: Wednesday January 31, 2024 at 9:30am	
Facility	Location
712, Westside WWTP	1501 Woodswether Rd, Kansas City, MO 64105
637, South Airport Relief Flood Station	102 NW Lou Holland Dr, Kansas City, MO 64116
676, South Air Pumping Sanitary Station	101 NW Lou Holland Dr, Kansas City, MO 64116
606, Gillis Flood Station	1000 E. Riverfront Dr, Kansas City, MO 64120

Day 4: Thursday February 1, 2024 at 9am	
Facility	Location
612, Blue Bank Flood Station	7601 Hawthorne Rd, Kansas City, MO 64120
711, Birmingham WWTP	10801 NE 28 th St, Kansas City, MO 64161
693, Birmingham Sanitary Station	39.174211, -94.445518

It is requested, but not required, that anyone intending to participate in site visits notify David Elge via email (David.Elge@kcmo.org) so that considerations can be made for addressing the volume of participants and vehicles. Please also consider that the first visit each day has a scheduled start time, and the timing of subsequent visits will be determined by the time spent at each facility.



SUPPLEMENTARY CONDITIONS

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

SC-2.03 A. Article 2, Paragraph 2.03, Copies of Documents, is amended by deleting Paragraph 2.03 A and replacing it with the following:

- A. CITY shall furnish to CONTRACTOR up to One (1) copies of the Drawings and Specifications, including Addenda.

In the preparation of the Contract Documents, no reports of explorations and tests of subsurface conditions at or contiguous to the Site of the Work have been prepared.

In the preparation of the Contract Documents, no drawings of physical conditions in or relating to existing surface or subsurface structures which are at or contiguous to the Site of the Work were utilized.

SC-4.06 Article 4, Paragraph 4.06, Asbestos, Lead-Based Paint, PCBs, Petroleum Waste or Radioactive Material, Subparagraphs A and B are supplemented as follows:

In the preparation of the Contract Documents, no reports of explorations and tests of any Hazardous Environmental Condition(s) at the Site of the Work were utilized.

SC- 5.01 A. Article 5, Paragraph 5.01, Performance, Payment and Other Bonds, Subparagraph A, second sentence, is revised as follows:

These Bonds shall remain in effect at least until **two (2) years** after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents.

SC-5.03 A. Article 5, Paragraph 5.03 Certificates of Insurance, Subparagraph A is amended by adding the following Subparagraph 1:

1. CONTRACTOR shall obtain evidence that all Subcontractors have in force the required coverage in the amounts required by these Contract Documents, and evidence that each is current on its unemployment insurance payments before Subcontractors begin Work at the Site. CONTRACTOR shall retain such evidence in its files and make available to CITY within ten (10) days after written request.

SC-5.04 C. Article 5, Paragraph 5.04, CONTRACTOR's Liability Insurance, Subparagraph C is amended as follows:

The following additional policies of insurance are required:

5. Railroad Protective Liability Insurance. This insurance shall be issued in the name of the Railroad Company specified below and shall protect and defend the railroad against claims arising as a result of the operations of CONTRACTOR. This insurance shall be acceptable to the railroad and shall be maintained in force throughout the period when CONTRACTOR is

working on or adjacent to property owned by the railroad. CONTRACTOR shall not enter upon the Railroad Company's premises until this insurance is in effect. The aggregate liability limits per job site for bodily injury and property damage shall be not less than those limits required by the respective Railroad Company.

Railroad Protective Liability Insurance shall be issued in the name of the following railroad(s):
Norfolk Southern

6. Environmental Liability Insurance. This insurance shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against claims for injuries to members of the public and damage to the property of others resulting from environmental impairment. The liability limits of the environmental policy shall not be less than \$2,000,000.
7. Asbestos Liability Insurance. This insurance shall be an "occurrence" policy and shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against all claims arising from bodily injury, sickness, disease or death of any person other than the CONTRACTOR's employees arising out of any act related to asbestos abatement work. The liability limits for bodily injury and property damage shall be not less than:

\$1,000,000 each occurrence
\$2,000,000 general aggregate

If CONTRACTOR provides Environmental or Asbestos Liability Insurance through a Subcontractor, CONTRACTOR shall contractually require the Subcontractor to include CITY, DESIGN PROFESSIONAL and CONSULTANTS as additional insureds in the Subcontractor's policy. CONTRACTOR shall deliver to CITY, prior to the start of any Work at the Project Site, properly completed certificates of insurance or other evidence that the required insurance is in full force and effect, in a form acceptable to CITY. CONTRACTOR shall contractually require its Subcontractor to defend, indemnify and hold harmless CITY from and against all Claims arising out of or resulting from all acts or omissions in connection with this Contract caused in whole or in part by Subcontractor or Subcontractor's agents, regardless of whether or not caused in part by any act or omission, including negligence, of CITY. CONTRACTOR must provide evidence that this requirement has been complied in accordance with the provisions of Paragraphs 6.01 B and 6.06 G.

SC-5.06 A. Article 5, Paragraph 5.06, Property Insurance, Paragraph A, is amended by adding the following after the first sentence:

Property Insurance on the Work at the Site shall be written with a deductible amount not to exceed \$10,000.00.

SC-6.06 A.1 Article 6, Paragraph 6.06 Substitutes and "Or-Equal" Items, Paragraph A is amended by adding the following at the end of Paragraph A.1:

Proposed "or-equal" items must be submitted to CITY at least eleven (11) days prior to Bid date at the following address:

4800 East 63rd Street
Kansas City, Missouri 64130
Attn: Morris Ross, Project Manager

Only Bidders may submit proposed "or-equal" items and such items must require no change in related Work. Acceptance by CITY of any proposed "or-equal" items will be made by Addendum only.

SC-6.06 A.2. Article 6, Paragraph 6.06 Substitutes and "Or-Equal" Items, Paragraph A is amended by adding the following at the end of Paragraph A.2:

Proposed substitute items must be submitted to CITY's Representative not later than forty-five (45) days prior to the time the item is to be incorporated into the Work. Only CONTRACTOR may submit proposed substitute items, and such items must be submitted to CITY's Representative on the standard City form 01630 - Substitution Request. Acceptance by CITY of any proposed substitute item will be made by Change Order.

SC-6.07 J Article 6, Paragraph 6.07, concerning Subcontractors, Suppliers and Others, is supplemented by adding Subparagraph J as follows:

CONTRACTOR shall perform with its own organization Work amounting to not less than 25% of the total Contract Price. "Its own organization" shall be construed to include only workers employed and paid by the CONTRACTOR and equipment owned or rented by the CONTRACTOR, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the CONTRACTOR.

SC-6.10. Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraphs immediately following Subparagraph 6.10 I 2:

- a. CONTRACTOR will be required to comply with wage rates as follows:

County – Clay, Jackson, and Platte

Work Type: State – Building

SC-6.10 T. Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraph 6.10 T:

Contract Information Management System. CONTRACTOR shall comply with CITY's Contract Information Management System requirements. CONTRACTOR shall use CITY's Internet web based Contract Information Management System/Project Management Communications Tool provided by CITY and protocols included in that software during the term of this Contract. CONTRACTOR shall maintain user applications to CITY's provided system for all personnel, subcontractors or suppliers as applicable.

SC-6.11. Article 6, Paragraph 6.11, Taxes, is amended by adding the following sentence to Subparagraph 6.11 B:

B. Tax Compliance. The following subparagraphs apply if the Contract is over \$160,000.00.

SC-9.02 A. Article 9, Paragraph 9.02, Resident Project Representative, Subparagraph A is supplemented as follows:

The responsibilities, authority and limitations of authority of DESIGN PROFESSIONAL's resident Project representative as stated in Paragraph 9.08 are modified as follows:

SC-9.08 E. Article 9, Paragraph 9.08, Limitations on DESIGN PROFESSIONAL's Authority and Responsibilities, Subparagraph E is supplemented as follows:

DESIGN PROFESSIONAL's Consultant(s), resident Project representative and assistant(s) to the resident Project representative are the following:

Consultant(s): Black & Veatch Corporation

SC-12.01 Article 12, Paragraph 12.01, Time of the Essence is amended by adding the following new Subparagraphs immediately following Subparagraph 12.01 A:

B. Starting and Completion

1. The Work to be performed under this Contract shall begin on the date specified in the written Notice to Proceed issued by the Director of KC Water, and the Work shall be substantially complete, in accordance with Paragraph 14.04, **within 1,095 Calendar Days thereafter**. Once the Work starts, CONTRACTOR shall continuously pursue completion of the Work.
2. The Work shall be completed and ready for final payment in accordance with Paragraph 14.07 within 90 Calendar Days after the date of Substantial Completion of the Work.

C. Liquidated Damages

1. If the Work is not substantially completed, in accordance with Paragraph 14.04, within the period stated in Paragraph 12.01 B.1, CONTRACTOR shall pay to CITY the amount of five-thousand dollars (\$5,000) as liquidated damages and not as a penalty for each Calendar Day until the Work is substantially complete. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.
2. If the Work is not completed and ready for final payment in accordance with Paragraph 14.07, within the period stated in Paragraph 12.01 B.3, CONTRACTOR shall pay to CITY the amount of one thousand dollars (\$1,000) as liquidated damages and not as a penalty for each Calendar Day until the Work is completed and ready for final payment. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.

SC-13.07 Article 13, Paragraph 13.07, Correction Period, Subparagraph A is amended as follows:

The correction period set forth in Paragraph 13.07 A shall be two (2) years from substantial completion of the project instead of one (1) year, which longer period of time shall also be applicable to the correction period set forth in Paragraph 13.07 C. All other provisions of Paragraph 13.07 remain unchanged except as necessary to accommodate the revised length of the correction period. Partial Utilization shall not reduce the warranty period.

SC-14.01 Article 14, Paragraph 14.01, Add the following Subparagraph B and C as follows:

B. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

- a. Application for Payment forms with Continuation Sheets.

2. Submit the Schedule of Values to Project Manager for approval as indicated within the Contract. Refer to Article 2, Preliminary Matters; and Article 13, Payments to Contractor and Completion.

SC-14.02 A. Article 14, Paragraph 14.02, Application for Progress Payments, Subparagraph A is amended by deleting Item 3 and adding the following:

3. CITY shall make payments to CONTRACTOR monthly on or about the 15th day of each month. Payments to CONTRACTOR will be made on the basis of ninety-five percent (95%) of the value of the Work satisfactorily completed plus ninety-five percent (95%) of the value of properly stored and insured, unused materials on hand on the Site of the Work. CITY shall retain five percent (5%) of each partial payment until completion and acceptance of the Work covered by the Contract and final payment is due. All Work covered by a payment becomes CITY's property, provided that the Work paid for remains the sole responsibility of CONTRACTOR until all terms and conditions of the Contract have been met.

SC-14.02 A. Article 14, Paragraph 14.02, Application for Progress Payments, Subparagraph A is amended by adding the following:

4. Provide an updated Construction Schedule with each payment application.
5. Provide CREO Form 485.01 MWBE Monthly Utilization Report with each payment request.

SC-14.04. Article 14, Paragraph 14.04, Substantial Completion, Subparagraph A is supplemented as follows:

- A. To be considered substantially complete, the following items of the Work must be operational and ready for CITY's continuous use as intended:
 - Installation of all SCADA systems at the facilities
 - Startup and commissioning completed including any performance tests
 - Installation of fiber and/or radios where applicable
 - Fiber/radio testing must be complete and documented to demonstrate fiber/radio is ready for use.

SC-14.05 Article 14, Paragraph 14.05, Partial Utilization is amended by adding the following new Subparagraph A.3. immediately following Subparagraph 14.05 A.2:

3. CITY at any time may make a written request to CONTRACTOR to permit CITY to take over operation of any part of the Work although it is not substantially complete. A copy of the request will be sent to DESIGN PROFESSIONAL, and within a reasonable time thereafter CITY, CONTRACTOR and DESIGN PROFESSIONAL shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not make written objection to CITY and DESIGN PROFESSIONAL that such part of the Work is not ready for separate operation by CITY, DESIGN PROFESSIONAL will finalize the list of items to be completed or corrected and will deliver such lists to CITY and CONTRACTOR. DESIGN PROFESSIONAL will also make a written recommendation as to the division of responsibilities pending final payment between CITY and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for that part of the Work, which recommendation will become binding upon CITY and CONTRACTOR at the time when CITY takes over such operation (unless they shall have otherwise agreed in writing and so informed DESIGN PROFESSIONAL). During such operation and prior to Substantial Completion of such part of the Work, CITY shall allow CONTRACTOR reasonable access to complete or correct items on said list and to complete other related Work.

CITY OF FOUNTAINS
HEART OF THE NATION



KANSAS CITY
MISSOURI

BID FORM/CONTRACT

ADDENDUM 1

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

1. Bidder, having examined the Bidding Documents, related documents and the Site of the Work, and being familiar with all the conditions affecting the construction of the proposed Work, including Laws and Regulations and the availability of materials and supplies, agrees, if this Bid is selected by CITY, this Bid Form/Contract will become the Contract between Bidder and CITY for Bidder to furnish all labor and materials, equipment and services necessary for the proper completion of the Work in accordance with the Contract Documents, including general construction work at the price(s) stated below, which stated sums include fees and all other charges applicable to materials, appliances, labor and all things subject to and upon which other charges may be levied.
2. Bidder agrees the Contract Documents will comprise the entire agreement between CITY and Bidder. The Contract Documents are identified in the General Conditions and are incorporated into and made part hereof this Bid Form/Contract by reference.
3. Bidder agrees that if this Bid Form/Contract is executed by CITY, Bidder's offer is accepted and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties. Bidder authorizes the CITY to fill in the Contract Price on this Bid Form/Contract in accordance with Bidder's Bid. Bidder agrees that this Bid Form/Contract may be executed in one or more counterparts, each of which will be deemed an original copy of this Bid Form/Contract and all of which, when taken together, will be deemed to constitute one and the same Bid Form/Contract. This Bid Form/Contract shall be effective upon the execution of counterparts by both parties, notwithstanding that both parties may not sign the same counterpart. The parties' signatures transmitted by facsimile or by other electronic means shall be proof of the execution of this Bid Form/Contract and shall be acceptable in a court of law. A copy of this Bid Form/Contract shall constitute an original and shall be acceptable in a court of law.

4. The Bid Price(s) shall be shown in numeric figures only.

TOTAL BASE BID IN NUMERIC FIGURES	\$ _____
ALLOWANCE NO. 1	\$ <u>\$150,000</u>
ALLOWANCE NO. 2	\$ <u>\$64,581.72</u>
TOTAL BID IN NUMERIC FIGURES	\$ _____

5. The undersigned Bidder has given CITY'S Project Manager written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the Project Manager or by the DESIGN PROFESSIONAL is acceptable to Bidder.
6. The undersigned Bidder agrees that this Bid shall remain subject to selection by CITY, and may not be withdrawn for ninety (90) days after the day Bids are opened.
7. The undersigned Bidder certifies that this Bid contains no modifications, deviations, riders or qualifications.
8. Forms 00412 Unit Prices and 00413 Allowances contain prices included in the Base Bid, and are incorporated into this Bid. Forms must be completed and returned with this Bid.

Bidder: _____

9. The undersigned Bidder acknowledges receipt of the following addenda listed by number and date appearing on each addendum:

Addendum Number	Dated	Addendum Number	Dated
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)

10. By submitting its bid, Bidder is agreeing to meet or exceed the minimum employment goals of 10% minority and 2% women during the term of its contract with the City, or request a waiver of the goals. If a waiver is requested, Bidder must establish good faith efforts towards meeting the goals as set forth in the HRD Instructions for Construction Contracts and the City’s Construction Employment Program Ordinance (commonly known as the “Workforce Ordinance”) (City Code Section 3-515). Within forty-eight (48) hours after bid opening, the construction contractor shall submit **HRD Employee Identification Report Form-Rev. 102715** which shall include: the name, home address, job title, sex and race/ethnicity of each person the contractor anticipates will be performing construction labor hours creditable towards the minimum workforce goals applicable to the construction contractor individually.
11. Should Bidder fail to meet or exceed the minimum employment goals or otherwise establish that Bidder is entitled to a waiver under circumstances in which Bidder has previously failed to meet or exceed the goals on one or more occasions with the twenty-four month period immediately preceding the completion of the Work under this Bid Form/Contract, Bidder may be suspended from participating, either as a contractor or subcontractor, on any future contract with the City for a period ranging from thirty days to six months as further specified in the Contract Documents. This program is distinguished from the M/WBE Program in that it is not based on company ownership but rather is based on workforce hours instead of a budgetary allocation of work.
12. By submitting its bid, Bidder warrants that if its bid should exceed \$300,000.00 and Bidder employs fifty (50) or more people, Bidder has an affirmative action program in place and will maintain the affirmative action program in place for the duration of its contract with the City. Bidder further warrants that it will comply with the affirmative action requirements contained in the General Conditions as incorporated by reference into this Bid Form/Contract.
13. Section 15 through Section 18 constitutes the Affidavit of Intended Utilization required to be submitted by Bidders.

Bidder: _____

14. By submitting its bid, Bidder is agreeing to the following: (1) Bidder has made by bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; or Bidder will continue to make during the 48 hours after bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; and (2) Bidder will timely submit its **00450 HRD 08 Contractor Utilization Plan/Request for Waiver** and **00450.01 Letter of Intent to Subcontract** for each MBE/WBE listed on the 00450 HRD 08 Construction Contractor Utilization Plan/Request for Waiver;; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE/DBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder forfeiting its bid bond.

PROJECT GOALS: **15% MBE 14% WBE _____ % DBE**

BIDDER PARTICIPATION: _____ % MBE _____ % WBE _____ % DBE

15. To the best of Bidder’s knowledge, the following are names of certified MBEs and/or WBEs with whom Bidder, or Bidder’s subcontractors, presently intend to contract with if awarded the Contract on the above project: **(All firms must currently be certified by Kansas City, Missouri Human Relations Department)**

A. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

B. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

C. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

D. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

E. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

Bidder: _____

F. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

(List additional MBE/WBEs, if any, on additional pages and attach to this form)

16. By submitting its bid, Bidder is agreeing it will identify and timely submit within 48 Hours after Bid opening those MBE/WBE subcontractors with dollar amounts and scopes of work, which apply to or exceed the MBE/WBE goals for the Project on the **00450 HRD 08 Contractor Utilization Plan/Request for Waiver**.

17. Bidder agrees that failure to meet or exceed the MBE/WBE Goals for the above project will require the Director of Human Relations to recommend disapproval of the bid unless the Director of Human Relations finds the Bidder established good faith efforts towards meeting the goals as set forth in the HRD Forms and Instructions for Construction Projects and the City's MBE/WBE Ordinance.

Business Entity Type:

- Missouri Corporation
- Foreign Corporation
- Fictitious Name Registration
- Sole Proprietor
- Limited Liability Company
- Partnership
- Joint Venture
- Other: (Specify) _____

BIDDER

Legal name & address of Bidder, person firm, partnership, corporation, or association submitting Bid:

Phone No: _____
Cell No: _____
Facsimile No: _____
Bidder's E-Mail: _____

Federal ID. No. _____

I hereby certify that I have authority to execute this document on behalf of Bidder, person, firm, partnership, corporation or association submitting Bid.

By: _____
(Signature)

(Print Name)

Title: _____

Date: _____

(Attach corporate seal if applicable)

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20__.

My Commission Expires: _____

Bidder: _____

ACCEPTANCE OF BID

CITY, by executing this Bid Form/Contract, hereby accepts Bidder's Bid and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the Parties.

CITY shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents a maximum amount of _____ Dollars, (\$ _____). The Contract Price includes:

00412 Unit Prices, included in the Bid, a copy of which is attached

00413 Allowances, included in the Bid, a copy of which is attached

By executing this Bid Form/Contract, CITY accepts Bidder's offer for the Contract Price stated above and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties

City of Kansas City, Missouri (OWNER or City)

Approved as to form:

Assistant City Attorney

I hereby certify that there is a balance, otherwise unencumbered, to the credit of the appropriation to which the foregoing expenditure is to be charged, and a cash balance, otherwise unencumbered, in the treasury, to the credit of the fund from which payment is to be made, each sufficient to meet the obligation hereby incurred.

Director of Finance

(Date)

Bidder: _____

CITY OF FOUNTAINS
HEART OF THE NATION



KANSAS CITY
MISSOURI

ALLOWANCE FORM

ADDENDUM 1

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

Allowance No.:	Allowance Description:	Allowance in Figures:
1	Project Change Allowance	\$150,000.00
2	Pre-negotiated software	\$64,581.72

Section 01210 - ALLOWANCES

1. GENERAL. This section includes a description of the allowances and related responsibilities.

2. ALLOWANCE AMOUNTS

1. Unforeseen site conditions, hardware and programming additions, licensing additions, railroad ROW work, and unknown conditions: \$150,000.
2. Pre-negotiated Rockwell Automation software purchase: \$64,581.72.

3. DUTIES OF CONTRACTOR IN PROVIDING PRODUCTS BY ALLOWANCE

- A. Advise Engineer at least 60 days in advance of purchase date necessary to avoid impacts to Progress Schedule.
- B. Obtain proposals from suppliers, including:
 - Quantity.
 - Complete description of product and services provided under allowance.
 - Unit cost.
 - Total amount of purchase.

4. ADJUSTMENT OF COSTS

- A. When actual cost is more or less than amount of allowance, Contract Price will be adjusted by Change Order.

5. ALLOWANCE NO. 1

- A. Unforeseen site conditions.
- B. Additional Programming, License Additions, and other additions
At Owner's discretion, additional programming and licensing may be covered through the allowance.

6. ALLOWANCE NO. 2

- A. Pre-negotiated Software Purchase.
 - Pricing for Rockwell Software products required for purchase, programming, and commissioning of the Wastewater SCADA System has been pre-negotiated with Rensenhouse. Contractor shall purchase the software included in the allowance.

End of Section



ADDENDUM NUMBER 2

Project Number 81000819/1712

Project Title Wastewater SCADA System Improvements

ISSUE DATE: 2/7/2024

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on **February 13, 2024**, are amended as follows:

Information to Bidders The following is provided to Bidders for information only:

1. Bid Option for Process Controllers and OIT.

Specifications

1. Replace section 00010 with an updated version.
2. Replace section 00410 with an updated version.
3. Replace section 00412 with an updated version.
4. Add in section 00420 – Bid Alternates.

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

City of Kansas City, Missouri Water Services Department
WW SCADA Improvements
City Contract No. 1712 – Project No. 81000819 – B&V Project No. 411741

OPTION FOR PROCESS CONTROLLERS AND OITS

Part 1 – Controllers

In order to enable all Phase 2 SCADA sites to use the latest version of PlantPax and for the project to receive official Rockwell PlantPax verification, all sites must use process controllers, rather than the standard controllers either originally specified or currently in place and intended to be reused. The PLC hardware changes are as listed below.

- A. For the following sites, no changes:
 - a. Facility 600, Southwest Boulevard Sanitary and Flood Station
 - b. Facility 601, 25th Street Flood Station
 - c. Facility 687, Upper Rush Sanitary Station
 - d. Facility 696, Weatherby Lake Sanitary Station
- B. For the following sites, provide a 1756-L81EP instead of a 1756-L82E:
 - a. Facility 603, Broadway Flood Station
 - b. Facility 606, Gillis Flood Station
 - c. Facility 607, Lydia Flood Station
 - d. Facility 608, Prospect Flood Station
 - e. Facility 611, Hawthorn Flood Station
 - f. Facility 612, Blue Bank Flood Station
 - g. Facility 614, South Airport Flood Station
 - h. Facility 619, North Church Estates Sanitary Station
 - i. Facility 637, South Airport Relief Flood Station
 - j. Facility 642, Wildwood West Sanitary Station
 - k. Facility 646, Briarcliff West Sanitary Station
 - l. Facility 657, Northland Mobile Sanitary Station
 - m. Facility 659, Chouteau Sanitary Station
 - n. Facility 662, Riverside Horizons Sanitary Station
 - o. Facility 663, Birchwood Sanitary Station
 - p. Facility 667, 12th St Sanitary Station
 - q. Facility 676, South Air Pumping Sanitary Station
 - r. Facility 677, 118th and Lawndale Sanitary Station
 - s. Facility 684, White Aloe Sanitary Station
 - t. Facility 686, Brush Creek Sanitary Station
 - u. Facility 688, Harlem Sanitary Station
 - v. Facility 692, 83rd St Sanitary Station
 - w. Facility 694, Mace Road Sanitary Station
 - x. Facility 697, Platte Woods Sanitary Station
 - y. Facility 699, Kemper Flood Station
 - z. Facility 745, KCI De-Icing Flood Station
 - aa. Facility 848, East Tank Tower
- C. For the following sites, provide a 1756-L83EP instead of leaving the existing processor in-place:

- a. Facility 623, Pied Creek Sanitary Station
 - b. Facility 631, First Creek Sanitary Station
 - c. Facility 631, Second Creek Sanitary Station
 - d. Facility 664, Gregory Ridge Sanitary Station
 - e. Facility 682, Lake Waukomis Sanitary Station
 - f. Facility 693, Birmingham Sanitary Station
- D. For the following site, provide a 1756-L83EP instead of a 1756-L82E:
- a. Facility 711, Birmingham WWTP
- E. For the following sites, provide a 5069-L320ERP instead of leaving the existing processor in-place:
- a. Facility 604, North Airport Flood Station
 - b. Facility 609, Milwaukee Flood Station
 - c. Facility 610, Truman Flood Station

Part 2 – OITs

In order to enable all Phase 2 SCADA sites with OITs to use the latest version of PlantPAx and for the project to receive official Rockwell PlantPAx verification, all sites with OITs must use series 5510 OITs. The OIT hardware changes are as listed below.

- A. For the following sites, provide a 2715P-T15CD instead of a 2711P-T12W22A9P:
 - a. Facility 657, Northland Mobile Sanitary Station
- B. For the following sites, provide a 2715P instead of leaving the existing OIT in-place:
 - a. Facility 623, Pied Creek Sanitary Station
 - b. Facility 631, First Creek Sanitary Station
 - c. Facility 632, Second Creek Sanitary Station
 - d. Facility 662, Riverside Horizons Sanitary Station
 - e. Facility 664, Gregory Ridge Sanitary Station
 - f. Facility 693, Birmingham Sanitary Station
 - g. Facility 711, Birmingham WWTP
- C. For all other sites, there is no change.



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Project Title: Wastewater SCADA System Improvements Phase 2

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CITY OF FOUNTAINS
HEART OF THE NATION



KANSAS CITY
MISSOURI

BID FORM/CONTRACT

ADDENDUM 2

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

1. Bidder, having examined the Bidding Documents, related documents and the Site of the Work, and being familiar with all the conditions affecting the construction of the proposed Work, including Laws and Regulations and the availability of materials and supplies, agrees, if this Bid is selected by CITY, this Bid Form/Contract will become the Contract between Bidder and CITY for Bidder to furnish all labor and materials, equipment and services necessary for the proper completion of the Work in accordance with the Contract Documents, including general construction work at the price(s) stated below, which stated sums include fees and all other charges applicable to materials, appliances, labor and all things subject to and upon which other charges may be levied.
2. Bidder agrees the Contract Documents will comprise the entire agreement between CITY and Bidder. The Contract Documents are identified in the General Conditions and are incorporated into and made part hereof this Bid Form/Contract by reference.
3. Bidder agrees that if this Bid Form/Contract is executed by CITY, Bidder's offer is accepted and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties. Bidder authorizes the CITY to fill in the Contract Price on this Bid Form/Contract in accordance with Bidder's Bid. Bidder agrees that this Bid Form/Contract may be executed in one or more counterparts, each of which will be deemed an original copy of this Bid Form/Contract and all of which, when taken together, will be deemed to constitute one and the same Bid Form/Contract. This Bid Form/Contract shall be effective upon the execution of counterparts by both parties, notwithstanding that both parties may not sign the same counterpart. The parties' signatures transmitted by facsimile or by other electronic means shall be proof of the execution of this Bid Form/Contract and shall be acceptable in a court of law. A copy of this Bid Form/Contract shall constitute an original and shall be acceptable in a court of law.
4. The Bid Price(s) shall be shown in numeric figures only.

TOTAL BASE BID IN NUMERIC FIGURES	\$ _____
ALLOWANCE NO. 1	\$150,000.00
ALLOWANCE NO. 2	\$64,581.72
TOTAL BID ALTERNATE NO. 1 IN NUMERIC FIGURES	\$ _____
TOTAL SUM – BID IN NUMERIC FIGURES	\$ _____

5. The undersigned Bidder has given CITY'S Project Manager written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the Project Manager or by the DESIGN PROFESSIONAL is acceptable to Bidder.
6. The undersigned Bidder agrees that this Bid shall remain subject to selection by CITY, and may not be withdrawn for ninety (90) days after the day Bids are opened.
7. The undersigned Bidder certifies that this Bid contains no modifications, deviations, riders or qualifications.
8. Forms 00412 Unit Prices and 00413 Allowances contain prices included in the Base Bid, and are incorporated into this Bid. Form(s) must be completed and returned with this Bid.

Bidder: _____

- 9. Form 00420 - Alternates contains work and prices which modify the Base Bid, if selected, and is incorporated into this Bid. This form must be completed and returned with this Bid.
- 10. The undersigned Bidder acknowledges receipt of the following addenda listed by number and date appearing on each addendum:

Addendum Number	Dated	Addendum Number	Dated
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)

- 11. By submitting its bid, Bidder is agreeing to meet or exceed the minimum employment goals of 10% minority and 2% women during the term of its contract with the City, or request a waiver of the goals. If a waiver is requested, Bidder must establish good faith efforts towards meeting the goals as set forth in the CREO KC Instructions for Construction Contracts and the City’s Construction Employment Program Ordinance (commonly known as the “Workforce Ordinance”) (City Code Section 3-515). Within forty-eight (48) hours after bid opening, the construction contractor shall submit **CREO KC Employee Identification Report Form** which shall include: the name, home address, job title, sex and race/ethnicity of each person the contractor anticipates will be performing construction labor hours creditable towards the minimum workforce goals applicable to the construction contractor individually.
- 12. Should Bidder fail to meet or exceed the minimum employment goals or otherwise establish that Bidder is entitled to a waiver under circumstances in which Bidder has previously failed to meet or exceed the goals on one or more occasions with the twenty-four month period immediately preceding the completion of the Work under this Bid Form/Contract, Bidder may be suspended from participating, either as a contractor or subcontractor, on any future contract with the City for a period ranging from thirty days to six months as further specified in the Contract Documents. This program is distinguished from the M/WBE Program in that it is not based on company ownership but rather is based on workforce hours instead of a budgetary allocation of work.
- 13. By submitting its bid, Bidder warrants that if its bid should exceed \$300,000.00 and Bidder employs fifty (50) or more people, Bidder has an affirmative action program in place and will maintain the affirmative action program in place for the duration of its contract with the City. Bidder further warrants that it will comply with the affirmative action requirements contained in the General Conditions as incorporated by reference into this Bid Form/Contract.
- 14. Section 15 through Section 18 constitutes the Affidavit of Intended Utilization required to be submitted by Bidders.
- 15. By submitting its bid, Bidder is agreeing to the following: (1) Bidder has made by bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; or Bidder will continue to make during the 48 hours after bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; and (2) Bidder will timely submit its **00450 CREO KC 08 Contractor**

Bidder: _____

Utilization Plan/Request for Waiver and 00450.01 Letter of Intent to Subcontract for each MBE/WBE listed on the 00450 CREO KC 08 Construction Contractor Utilization Plan/Request for Waiver;; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE/DBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder forfeiting its bid bond.

PROJECT GOALS: 15% MBE 14% WBE _____ % DBE

BIDDER PARTICIPATION: _____ % MBE _____ % WBE _____ % DBE

16. To the best of Bidder’s knowledge, the following are names of certified MBEs and/or WBEs with whom Bidder, or Bidder’s subcontractors, presently intend to contract with if awarded the Contract on the above project: **(All firms must currently be certified by Kansas City, Missouri Human Relations Department)**

- A. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____
- B. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____
- C. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____
- D. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____
- E. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____
- F. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____

Bidder: _____

Area/Scope of work _____
Subcontract amount _____

(List additional MBE/WBEs, if any, on additional pages and attach to this form)

- 17. By submitting its bid, Bidder is agreeing it will identify and timely submit within 48 Hours after Bid opening those MBE/WBE subcontractors with dollar amounts and scopes of work, which apply to or exceed the MBE/WBE goals for the Project on the **00450 CREO KC 08 Contractor Utilization Plan/Request for Waiver**.
- 18. Bidder agrees that failure to meet or exceed the MBE/WBE Goals for the above project will require the Director of Human Relations to recommend disapproval of the bid unless the Director of the Civil Rights and Equal Opportunity (CREO KC) Department finds the Bidder established good faith efforts towards meeting the goals as set forth in the CREO KC Forms and Instructions for Construction Projects and the City's MBE/WBE Ordinance.

Business Entity Type:

- Missouri Corporation
- Foreign Corporation
- Fictitious Name Registration
- Sole Proprietor
- Limited Liability Company
- Partnership
- Joint Venture
- Other: (Specify) _____

BIDDER

Legal name & address of Bidder, person firm, partnership, corporation, or association submitting Bid:

Phone No: _____

Cell No: _____

Facsimile No: _____

Bidder's E-Mail: _____

Federal ID. No. _____

I hereby certify that I have authority to execute this document on behalf of Bidder, person, firm, partnership, corporation or association submitting Bid.

By: _____
(Signature)

(Print Name)

Title: _____

Date: _____

(Attach corporate seal if applicable)

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20__.

My Commission Expires: _____

Bidder: _____

ACCEPTANCE OF BID

CITY, by executing this Bid Form/Contract, hereby accepts Bidder's Bid and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the Parties.

CITY shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents a maximum amount of _____ Dollars, (\$ _____). The Contract Price includes:

00412 Unit Prices, included in the Bid, a copy of which is attached

00413 Allowances, included in the Bid, a copy of which is attached

00420 Alternates, included in the Bid, a copy of which is attached

Alternate No. 1 - \$

By executing this Bid Form/Contract, CITY accepts Bidder's offer for the Contract Price stated above and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties

City of Kansas City, Missouri (OWNER or City)

Approved as to form:

Assistant City Attorney

I hereby certify that there is a balance, otherwise unencumbered, to the credit of the appropriation to which the foregoing expenditure is to be charged, and a cash balance, otherwise unencumbered, in the treasury, to the credit of the fund from which payment is to be made, each sufficient to meet the obligation hereby incurred.

Director of Finance (Date)

**UNIT PRICES****ADDENDUM 2**

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

NOTE: IN THE EVENT OF DISCREPANCY, UNIT PRICE SHALL GOVERN.

Item No.	Unit	Quantity	Item Description:	Unit Price	Extension
1	Hour	Open	Programming hourly rate		N/A
2	Each	Open	ControlLogix 1756-L82E Processor		N/A
3	Each	Open	ControlLogix 1756-L81EP Processor		N/A
4	Each	Open	ControlLogix 1756-L83EP Processor		N/A
5	Each	Open	CompactLogix 1769-L33ER Processor		N/A
6	Each	Open	CompactLogix 1756-L320ERP Processor		N/A
7	Each	Open	CompactLogix 1756-L340ERP Processor		N/A
8	Each	Open	Analog Input Card - ControlLogix - 1756-IF8I and removable terminal block		N/A
9	Each	Open	Analog Input Card - CompactLogix - 1769-IF4I		N/A
10	Each	Open	Analog Output Card - ControlLogix - 1756-OF8 and removable terminal block		N/A
11	Each	Open	Analog Output Card - CompactLogix - 1769-OF4CI		N/A
12	Each	Open	Discrete Input Card - ControlLogix - 120VAC - 1756-IA16 and removable terminal block		N/A
13	Each	Open	Discrete Input Card - CompactLogix - 120VAC - 1769-IA16		N/A
14	Each	Open	Discrete Input Card - ControlLogix - 24VDC - 1756-IB16 and removable terminal block		N/A
15	Each	Open	Discrete Input Card - CompactLogix - 24VDC - 1769-IQ16		N/A
16	Each	Open	Discrete Output Card - ControlLogix - 120VAC - 1756-OA16 and removable terminal block		N/A
17	Each	Open	Discrete Output Card - CompactLogix - 120VAC - 1769-OA16		N/A
18	Each	Open	Discrete Output Card - ControlLogix - 24VDC - 1756-OB16I and removable terminal block		N/A
19	Each	Open	Discrete Output Card - CompactLogix - 24VDC - 1769-OB16		N/A
20	Each	Open	Discrete Output Card - ControlLogix - Relay - 1756-OW16I and removable terminal block		N/A
21	Each	Open	Discrete Output Card - CompactLogix - Relay - 1769-OW8I		N/A
22	Each	Open	Ethernet/IP Card - ControlLogix - 1756-EN2T		N/A
23	Each	Open	Chassis - ControlLogix - 4-Slot		N/A
24	Each	Open	Chassis - ControlLogix - 7-Slot		N/A
25	Each	Open	Chassis - ControlLogix - 10-Slot		N/A

Item No.	Unit	Quantity	Item Description:	Unit Price	Extension
26	Each	Open	Chassis - ControlLogix - 13-Slot		N/A
27	Each	Open	Chassis - ControlLogix - 17-Slot		N/A
28	Each	Open	Power Supply - ControlLogix - 1756-PA72		N/A
29	Each	Open	Power Supply - CompactLogix - 1769-PA2		N/A
30	Each	Open	DNP3 Over Ethernet Gateway - DIN-rail mounted (ProSoft Technologies PLC51-DNPS)		N/A
31	Each	Open	DNP3 Over Ethernet Master Gateway - DIN-rail mounted (ProSoft Technologies PLC51-DNPM)		N/A
32	Each	Open	Layer 3 Stratix 5400 Ethernet Switch including 2 single mode bidirectional SFPs - 1783-HMS4SG8EG4CGR		N/A
33	Each	Open	Layer 3 Stratix 5400 Ethernet Switch including 2 single mode SFPs with separate transmit and receive - 1783- HMS4SG8EG4CGR		N/A
34	Each	Open	Layer 2 DIN-rail mounted Stratix Switch including 2 single mode bidirectional SFPs - 1783-BMS10CA		N/A
35	Each	Open	Security Appliance - Fortinet FGR-70F (model to be Contractor-determined to match devices included in bid)		N/A
36	Each	Open	Firewall (provide model included in bid: _____)		N/A
37	Each	Open	Thin Client Workstation - price to include hardware (including badge scanner) and associated programming		N/A
38	Each	Open	Fiber Optic Patch Panel - wall mounted		N/A
39	Each	Open	Fiber Optic Patch Panel - DIN-rail mounted		N/A
40	Each	Open	Splice connection to main fiber trunk line		N/A
41	Each	Open	Operator Interface Terminal - (provide model included in bid: _____)		N/A
42	Each	Open	Operator Interface Terminal (series 5510) - (provide model included in bid: _____)		N/A
43	Each	Open	Conformal coating add for PLC and OIT component on a per unit basis		N/A
44	LF	Open	3" HDPE Conduit (material and installation)		N/A
45	LF	Open	Fiber Optic Cable (12-strand backbone single mode fiber optic cable material and installation)		N/A
46	LF	Open	Fiber Optic Cable (96-strand backbone single mode fiber optic cable material and installation)		N/A
47	Each	Open	Uninterruptible power supply with network management card (APC SRT1500XLA, AP9640)		N/A

Note: May be printed, for manual fill-in, or filled in on electronic excel spreadsheet version.



ALTERNATES

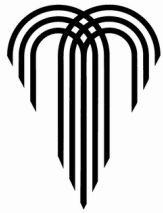
ADDENDUM 2

Project/Contract Numbers: 81000819/1712

Project Title: Wastewater SCADA System Improvements

Page _____ of _____

No:	Description:	<input type="checkbox"/> Add [+]	Price in Figures:
1	PLC/OIT changes to upgrade to PlantPAX 5.x instead of PlantPAX 4.x	<input type="checkbox"/> Deduct [-]	\$



CERTIFICATION PAGE

Project/Contract Number 81000819/1712

Project Title Wastewater SCADA System Improvements Phase 2

I am responsible for the following specifications and drawings:

Drawings:

None

Specifications:

Division 0, Division 1 (01210.01, 01290.01, 01290.02, 01290.03, 01290.05, 01290.07, 01290.09, 01290.11, 01290.12, 01290.13, 01290.14, 01290.15, 01320.01, 01320.02, 01320.03, 01330.01, 01630)

_____ (SEAL)

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

With regard to this Project, and pursuant to RSMO.327.411, Black & Veatch and the Professional whose personal seal and signature appears below assume responsibility only for the drawings, specifications, and other documents bearing the personal seal of the undersigned professional, and disclaim any responsibility for all other drawings, specifications, estimates, reports, or other documents which do not contain the personal seal of the undersigned professional.

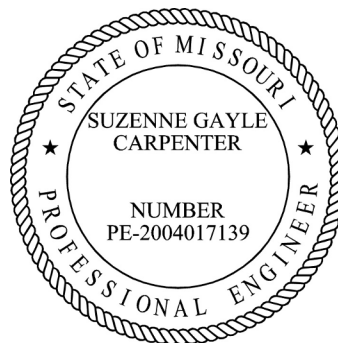
I am responsible for the following specifications and drawings:

Drawings:

Cover, 600-C-101, 601-C-101,
604-C-101, 604-C-102, 604-C-103,
606-C-101, 607-C-101, 607-I-102,
607-C-103, 609-C-101, 612-C-101,
614-C-101, 614-C-102, 614-C-103,
646-C-101, 659-C-101, 663-C-101,
663-C-102, 663-C-103, 664-C-101,
664-C-102, 664-C-103, 664-C-104,
676-C-101, 677-C-101, 682-C-101,
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687-C-104, 688-C-101, 692-C-101,
692-C-102, 692-C-103, 692-C-104,
692-C-105, 693-C-101, 693-C-102,
693-C-103, 693-C-104, 693-C-105,
693-C-106, 694-C-101, 694-C-102,
694-C-103, 696-C-101, 696-C-102,
696-C-103, 696-C-104, 697-C-101,
699-C-101, 711-C-101, 711-C-102,
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711-C-106, 711-C-107, 711-C-108,
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711-C-115, 715-C-101, 715-C-102,
715-C-103, 715-C-104, 715-C-105,
715-C-106, 715-C-107, 715-C-108,
715-C-109, 715-C-110, 715-C-111,
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848-C-106, 848-C-107

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01354, 01380, 01400, 01485, 01490, 01565, 01566,
01581, 01610, 01611, 01612, 01614, 01615, 01620,
01700, 01800, 01820)



(SEAL)

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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I am responsible for the following specifications and drawings:

Drawings:
Cover, 002-I-502, 002-I-503

Specifications:
Division 5 (05550)



(SEAL)

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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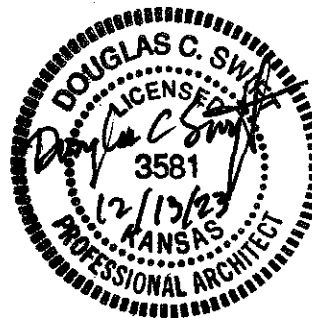
I am responsible for the following specifications and drawings:

Drawings:

Cover, 711CR-A-101,
711CR-A-102, 712CR-A-101,
712CR-A-102, 712CR-A-103,
718CR-A-101, 718CR-A-102,
720CR-A-101, 720CR-A-102

Specifications:

Division 4 (04220, 04511, 04300), Division 6 (06100),
Division 7 (07015, 07213, 07420, 07900), Division 8 (08111,
08700, 08800), Division 9 (09510, 09651, 09672, 09920),
Division 10 (10100, 10140, 10281, 10431, 10440)



(SEAL)

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00005 – Construction Certification Page

Kansas City WSD
WW SCADA System Improvements Phase 2

Issued for Bid
December 2023

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I am responsible for the following specifications and drawings:

Drawings:

Cover, 000-G-001, 000-G-002
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848-I-903

Specifications:

Division 13 (13500, 13510, 13520, 13530,
13540, 13550, 13561, 13566, 13570, 13590,
13591)



(SEAL)

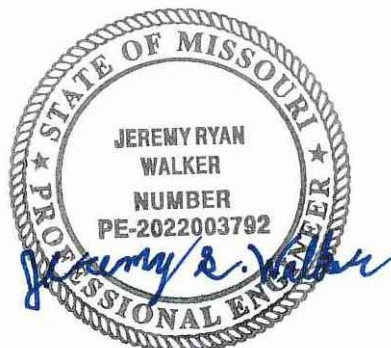
I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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I am responsible for the following specifications and drawings:

Drawings:
Cover, 001-H-001, 001-H-002,
002-H-501, 711CR-H-101,
711CR-P-101, 712CR-H-101,
712CR-H-102

Specifications:
Division 15 (15020, 15050, 15065, 15069, 15070, 15400,
15500, 15650, 15990)



Date 12-13-2023

(SEAL)

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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I am responsible for the following specifications and drawings:

Drawings:

Cover, 001-E-001, 001-E-002,
600-E-102, 601-E-102, 602-E-102,
603-E-102, 604-E-102, 606-E-102,
607-E-102, 608-E-102, 609-E-102,
610-E-102, 611-E-102, 612-E-102,
614-E-102, 619-E-102, 623-E-102,
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711CR-E-103, 712CR-E-101,
712CR-E-102, 718CR-E-101,
718CR-E-102, 720CR-E-101,
720CR-E-102, 745-E-102,
848-E-102

Specifications:

Division 16 (16050, 16100)



(SEAL)

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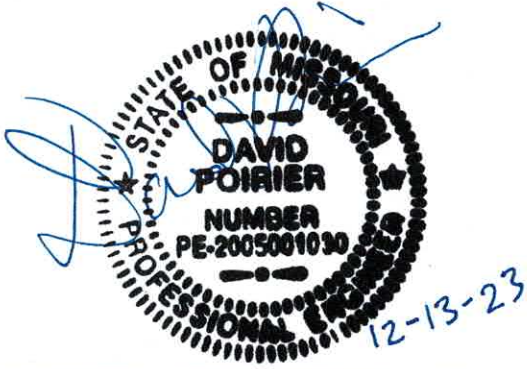
I am responsible for the following specifications and drawings:

Drawings:

Cover, 600-E-101, 601-E-101, 602-E-101,
603-E-101, 604-E-101, 606-E-101, 607-E-101,
608-E-101, 609-E-101, 610-E-101, 611-E-101,
612-E-101, 614-E-101, 619-E-101, 623-E-101,
631-E-101, 632-E-101, 637-E-101, 642-E-101,
643-E-101, 646-E-101, 657-E-101, 659-E-101,
662-E-101, 663-E-101, 664-E-101, 667-E-101,
676-E-101, 677-E-101, 682-E-101, 684-E-101,
686-E-101, 687-E-101, 688-E-101, 692-E-101,
693-E-101, 694-E-101, 696-E-101, 697-E-101,
699-E-101, 711-E-101, 745-E-101, 848-E-101

Specifications:

None



(SEAL)

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Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

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39	601-E-101	25TH STREET FLOOD STATION SITE PLAN	12/13/2023
40	601-E-102	25TH STREET FLOOD STATION FLOOR PLAN	12/13/2023
41	601-I-701	25TH STREET FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
42	601-I-901	25TH STREET FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023
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59	606-I-901	GILLIS FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023
60	606-I-902	GILLIS FLOOD STATION CONTROL PANEL LAYOUT	12/13/2023
61	607-C-101	LYDIA FLOOD STATION GENERAL FIBER LAYOUT PLAN	12/13/2023
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63	607-C-103	LYDIA FLOOD STATION FIBER LAYOUT PLAN SHEET 2 OF 2	12/13/2023
64	607-E-101	LYDIA FLOOD STATION SITE PLAN	12/13/2023
65	607-E-102	LYDIA FLOOD STATION FLOOR PLAN	12/13/2023
66	607-I-701	LYDIA FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
67	607-I-901	LYDIA FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023
68	607-I-902	LYDIA FLOOD STATION CONTROL PANEL LAYOUT	12/13/2023
69	608-E-101	PROSPECT FLOOD STATION SITE PLAN	12/13/2023
70	608-E-102	PROSPECT FLOOD STATION FLOOR PLAN	12/13/2023
71	608-I-701	PROSPECT FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
72	608-I-901	PROSPECT FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023
73	608-I-902	PROSPECT FLOOD STATION CONTROL PANEL LAYOUT	12/13/2023
74	609-C-101	MILWAUKEE FLOOD STATION GENERAL FIBER LAYOUT PLAN	12/13/2023
75	609-E-101	MILWAUKEE FLOOD STATION SITE PLAN	12/13/2023
76	609-E-102	MILWAUKEE FLOOD STATION FLOOR PLAN	12/13/2023
77	609-I-701	MILWAUKEE FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
78	609-I-901	MILWAUKEE FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023

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79	610-E-101	TRUMAN FLOOD STATION SITE PLAN	12/13/2023
80	610-E-102	TRUMAN FLOOD STATION FLOOR PLAN	12/13/2023
81	610-I-701	TRUMAN FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM – DEMO/NEW WORK	12/13/2023
82	610-I-901	TRUMAN FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023
83	611-E-101	HAWTHORN FLOOD STATION SITE PLAN	12/13/2023
84	611-E-102	HAWTHORN FLOOD STATION FLOOR PLAN	12/13/2023
85	611-I-701	HAWTHORN FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM – DEMO/NEW WORK	12/13/2023
86	611-I-901	HAWTHORN FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023
87	611-I-902	HAWTHORN FLOOD STATION CONTROL PANEL LAYOUT	12/13/2023
88	612-C-101	BLUE BANK FLOOD STATION GENERAL FIBER LAYOUT PLAN	12/13/2023
89	612-E-101	BLUE BANK FLOOD STATION SITE PLAN	12/13/2023
90	612-E-102	BLUE BANK FLOOD STATION FLOOR PLAN	12/13/2023
91	612-I-701	BLUE BANK FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM – DEMO/NEW WORK	12/13/2023
92	612-I-901	BLUE BANK FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023
93	612-I-902	BLUE BANK FLOOD STATION CONTROL PANEL LAYOUT	12/13/2023
94	614-C-101	SOUTH AIRPORT FLOOD STN GENERAL FIBER LAYOUT PLAN	12/13/2023
95	614-C-102	SOUTH AIRPORT FLOOD STN FIBER LAYOUT PLAN SHEET 1 OF 2	12/13/2023
96	614-C-103	SOUTH AIRPORT FLOOD STN FIBER LAYOUT PLAN SHEET 2 OF 2	12/13/2023
97	614-E-101	SOUTH AIRPORT FLOOD STN SITE PLAN	12/13/2023
98	614-E-102	SOUTH AIRPORT FLOOD STN FLOOR PLAN	12/13/2023
99	614-I-701	SOUTH AIRPORT FLOOD STN CONTROL SYSTEM BLOCK DIAGRAM – DEMO/NEW WORK	12/13/2023
100	614-I-901	SOUTH AIRPORT FLOOD STN DEMO/NEW WORK PHOTOS	12/13/2023
101	619-E-101	NORTH CHURCH ESTATES S STN SITE PLAN	12/13/2023
102	619-E-102	NORTH CHURCH ESTATES S STN FLOOR PLAN	12/13/2023
103	619-I-701	NORTH CHURCH ESTATES S STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
104	619-I-901	NORTH CHURCH ESTATES S STN DEMO/NEW WORK PHOTOS	12/13/2023
105	619-I-902	NORTH CHURCH ESTATES S STN COMMUNICATION PANEL LAYOUT	12/13/2023
106	623-E-101	PIED CREEK SANITARY STATION SITE PLAN	12/13/2023
107	623-E-102	PIED CREEK SANITARY STATION FLOOR PLAN	12/13/2023
108	623-I-701	PIED CREEK SANITARY STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
109	623-I-901	PIED CREEK SANITARY STATION DEMO WORK PHOTOS	12/13/2023
110	623-I-902	PIED CREEK SANITARY STATION NEW WORK PHOTOS	12/13/2023
111	623-I-903	PIED CREEK SANITARY STATION COMMUNICATION PANEL LAYOUT	12/13/2023
112	631-E-101	FIRST CREEK SANITARY STN SITE PLAN	12/13/2023
113	631-E-102	FIRST CREEK SANITARY STN FLOOR PLAN	12/13/2023
114	631-I-701	FIRST CREEK SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO WORK	12/13/2023
115	631-I-702	FIRST CREEK SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - NEW WORK	12/13/2023
116	631-I-901	FIRST CREEK SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
117	632-E-101	SECOND CREEK SANITARY STN SITE PLAN	12/13/2023
118	632-E-102	SECOND CREEK SANITARY STN FLOOR PLAN	12/13/2023
119	632-I-701	SECOND CREEK SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO WORK	12/13/2023
120	632-I-702	SECOND CREEK SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - NEW WORK	12/13/2023
121	632-I-901	SECOND CREEK SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
122	637-C-101	SOUTH AIRPORT RELIEF FL STN GENERAL FIBER LAYOUT PLAN	12/13/2023

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123	637-E-101	SOUTH AIRPORT RELIEF FL STN SITE PLAN	12/13/2023
124	637-E-102	SOUTH AIRPORT RELIEF FL STN FLOOR PLAN	12/13/2023
125	637-I-701	SOUTH AIRPORT RELIEF FL STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
126	637-I-901	SOUTH AIRPORT RELIEF FL STN DEMO/NEW WORK PHOTOS	12/13/2023
127	637-I-902	SOUTH AIRPORT RELIEF FL STN CONTROL PANEL LAYOUT	12/13/2023
128	642-E-101	WILDWOOD WEST SAN STN SITE PLAN	12/13/2023
129	642-E-102	WILDWOOD WEST SAN STN FLOOR PLAN	12/13/2023
130	642-I-701	WILDWOOD WEST SAN STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
131	642-I-901	WILDWOOD WEST SAN STN DEMO/NEW WORK PHOTOS	12/13/2023
132	643-E-101	KCI INDUSTRIAL SANITARY STN SITE PLAN	12/13/2023
133	643-E-102	KCI INDUSTRIAL SANITARY STN FLOOR PLAN	12/13/2023
134	643-I-701	KCI INDUSTRIAL SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
135	643-I-901	KCI INDUSTRIAL SANITARY STN DEMO WORK PHOTOS	12/13/2023
136	643-I-902	KCI INDUSTRIAL SANITARY STN NEW WORK PHOTOS	12/13/2023
137	646-C-101	BRIARCLIFF WEST SAN STN GENERAL FIBER LAYOUT PLAN	12/13/2023
138	646-E-101	BRIARCLIFF WEST SAN STN SITE PLAN	12/13/2023
139	646-E-102	BRIARCLIFF WEST SAN STN FLOOR PLAN	12/13/2023
140	646-I-701	BRIARCLIFF WEST SAN STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
141	646-I-901	BRIARCLIFF WEST SAN STN DEMO/NEW WORK PHOTOS	12/13/2023
142	646-I-902	BRIARCLIFF WEST SAN STN COMMUNICATION PANEL LAYOUT	12/13/2023
143	657-E-101	NORTHLAND MOBILE SAN STN SITE PLAN	12/13/2023
144	657-E-102	NORTHLAND MOBILE SAN STN FLOOR PLAN	12/13/2023
145	657-I-701	NORTHLAND MOBILE SAN STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
146	657-I-702	NORTHLAND MOBILE SAN STN CONTROL SYSTEM BLOCK DIAGRAM – NEW WORK	12/13/2023
147	657-I-901	NORTHLAND MOBILE SAN STN DEMO PHOTOS	12/13/2023
148	657-I-902	NORTHLAND MOBILE SAN STN NEW WORK PHOTOS	12/13/2023
149	659-C-101	CHOUTEAU SANITARY STATION GENERAL FIBER LAYOUT PLAN	12/13/2023
150	659-E-101	CHOUTEAU SANITARY STATION SITE PLAN	
151	659-E-102	CHOUTEAU SANITARY STATION FLOOR PLAN	12/13/2023
152	659-I-701	CHOUTEAU SANITARY STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
153	659-I-901	CHOUTEAU SANITARY STATION DEMO/NEW WORK PHOTOS	12/13/2023
154	662-E-101	RIVERSIDE HORIZONS SAN STN SITE PLAN	12/13/2023
155	662-E-102	RIVERSIDE HORIZONS SAN STN FLOOR PLAN	12/13/2023
156	662-I-701	RIVERSIDE HORIZONS SAN STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
157	662-I-901	RIVERSIDE HORIZONS SAN STN DEMO/NEW WORK PHOTOS	12/13/2023
158	662-I-902	RIVERSIDE HORIZONS SAN STN VENDOR PANEL I/O	12/13/2023
159	663-C-101	BIRCHWOOD SANITARY STN GENERAL FIBER LAYOUT PLAN	12/13/2023
160	663-C-102	BIRCHWOOD SANITARY STN FIBER LAYOUT PLAN SHEET 1 OF 2	12/13/2023
161	663-C-103	BIRCHWOOD SANITARY STN FIBER LAYOUT PLAN SHEET 2 OF 2	12/13/2023
162	663-E-101	BIRCHWOOD SANITARY STN SITE PLAN	12/13/2023
163	663-E-102	BIRCHWOOD SANITARY STN FLOOR PLAN	12/13/2023
164	663-I-701	BIRCHWOOD SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
165	663-I-901	BIRCHWOOD SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
166	663-I-902	BIRCHWOOD SANITARY STN COMMUNICATION PANEL LAYOUT	12/13/2023
167	664-C-101	GREGORY RIDGE SAN STN GENERAL FIBER LAYOUT PLAN	12/13/2023
168	664-C-102	GREGORY RIDGE SAN STN FIBER LAYOUT PLAN SHEET 1 OF 3	12/13/2023
169	664-C-103	GREGORY RIDGE SAN STN FIBER LAYOUT PLAN SHEET 2 OF 3	12/13/2023

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170	664-C-104	GREGORY RIDGE SAN STN FIBER LAYOUT PLAN SHEET 3 OF 3	12/13/2023
171	664-E-101	GREGORY RIDGE SAN STN SITE PLAN	12/13/2023
172	664-E-102	GREGORY RIDGE SAN STN FLOOR PLAN	12/13/2023
173	664-I-701	GREGORY RIDGE SAN STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
174	664-I-901	GREGORY RIDGE SAN STN DEMO/NEW WORK PHOTOS	12/13/2023
175	664-I-902	GREGORY RIDGE SAN STN COMMUNICATION PANEL LAYOUT	12/13/2023
176	667-E-101	12TH STREET SAN STATION SITE PLAN	12/13/2023
177	667-E-102	12TH STREET SAN STATION FLOOR PLAN	12/13/2023
178	667-I-701	12TH STREET SAN STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
179	667-I-901	12TH STREET SAN STATION DEMO/NEW WORK PHOTOS	12/13/2023
180	667-I-902	12TH STREET SAN STATION CONTROL PANEL LAYOUT	12/13/2023
181	676-C-101	SOUTH AIR PUMPING SAN STN GENERAL FIBER LAYOUT PLAN	12/13/2023
182	676-E-101	SOUTH AIR PUMPING SAN STN SITE PLAN	12/13/2023
183	676-E-102	SOUTH AIR PUMPING SAN STN FLOOR PLAN	12/13/2023
184	676-I-701	SOUTH AIR PUMPING SAN STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
185	676-I-901	SOUTH AIR PUMPING SAN STN DEMO/NEW WORK PHOTOS	12/13/2023
186	676-I-902	SOUTH AIR PUMPING SAN STN COMMUNICATION PANEL LAYOUT	12/13/2023
187	677-C-101	118TH AND LAWNSDALE S STN GENERAL FIBER LAYOUT PLAN	12/13/2023
188	677-E-101	118TH AND LAWNSDALE S STN SITE PLAN	12/13/2023
189	677-E-102	118TH AND LAWNSDALE S STN FLOOR PLAN	12/13/2023
190	677-I-701	118TH AND LAWNSDALE S STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
191	677-I-901	118TH AND LAWNSDALE S STN DEMO/NEW WORK PHOTOS	12/13/2023
192	682-C-101	LAKE WAUKOMIS SAN STN GENERAL FIBER LAYOUT PLAN	12/13/2023
193	682-C-102	LAKE WAUKOMIS SAN STN FIBER LAYOUT PLAN SHEET 1 OF 4	12/13/2023
194	682-C-103	LAKE WAUKOMIS SAN STN FIBER LAYOUT PLAN SHEET 2 OF 4	12/13/2023
195	682-C-104	LAKE WAUKOMIS SAN STN FIBER LAYOUT PLAN SHEET 3 OF 4	12/13/2023
196	682-C-105	LAKE WAUKOMIS SAN STN FIBER LAYOUT PLAN SHEET 4 OF 4	12/13/2023
197	682-E-101	LAKE WAUKOMIS SAN STN SITE PLAN	12/13/2023
198	682-E-102	LAKE WAUKOMIS SAN STN FLOOR PLAN	12/13/2023
199	682-I-701	LAKE WAUKOMIS SAN STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
200	682-I-901	LAKE WAUKOMIS SAN STN DEMO/NEW WORK PHOTOS	12/13/2023
201	684-C-101	WHITE ALOE SANITARY STN GENERAL FIBER LAYOUT PLAN	12/13/2023
202	684-E-101	WHITE ALOE SANITARY STN SITE PLAN	12/13/2023
203	684-E-102	WHITE ALOE SANITARY STN FLOOR PLAN	12/13/2023
204	684-I-701	WHITE ALOE SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
205	684-I-901	WHITE ALOE SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
206	686-C-101	BRUSH CREEK SANITARY STN GENERAL FIBER LAYOUT PLAN	12/13/2023
207	686-E-101	BRUSH CREEK SANITARY STN SITE PLAN	12/13/2023
208	686-E-102	BRUSH CREEK SANITARY STN FLOOR PLAN	12/13/2023
209	686-I-701	BRUSH CREEK SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
210	686-I-901	BRUSH CREEK SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
211	686-I-902	BRUSH CREEK SANITARY STN COMMUNICATION PANEL LAYOUT	12/13/2023
212	687-C-101	UPPER RUSH SANITARY STN GENERAL FIBER LAYOUT PLAN	12/13/2023
213	687-C-102	UPPER RUSH SANITARY STN FIBER LAYOUT PLAN SHEET 1 OF 3	12/13/2023
214	687-C-103	UPPER RUSH SANITARY STN FIBER LAYOUT PLAN SHEET 2 OF 3	12/13/2023
215	687-C-104	UPPER RUSH SANITARY STN FIBER LAYOUT PLAN SHEET 3 OF 3	12/13/2023
216	687-E-101	UPPER RUSH SANITARY STN SITE PLAN	12/13/2023
217	687-E-102	UPPER RUSH SANITARY STN FLOOR PLAN	12/13/2023

218	687-I-701	UPPER RUSH SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO WORK	12/13/2023
219	687-I-702	UPPER RUSH SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - NEW WORK	12/13/2023
220	688-C-101	HARLEM SANITARY STATION GENERAL FIBER LAYOUT PLAN	12/13/2023
221	688-E-101	HARLEM SANITARY STATION SITE PLAN	12/13/2023
222	688-E-102	HARLEM SANITARY STATION FLOOR PLAN	12/13/2023
223	688-I-701	HARLEM SANITARY STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
224	688-I-901	HARLEM SANITARY STATION DEMO/NEW WORK PHOTOS	12/13/2023
225	692-C-101	83RD STREET SANITARY STN GENERAL FIBER LAYOUT PLAN	12/13/2023
226	692-C-102	83RD STREET SANITARY STN FIBER LAYOUT PLAN SHEET 1 OF 4	12/13/2023
227	692-C-103	83RD STREET SANITARY STN FIBER LAYOUT PLAN SHEET 2 OF 4	12/13/2023
228	692-C-104	83RD STREET SANITARY STN FIBER LAYOUT PLAN SHEET 3 OF 4	12/13/2023
229	692-C-105	83RD STREET SANITARY STN FIBER LAYOUT PLAN SHEET 4 OF 4	12/13/2023
230	692-E-101	83RD STREET SANITARY STN SITE PLAN	12/13/2023
231	692-E-102	83RD STREET SANITARY STN FLOOR PLAN	12/13/2023
232	692-I-701	83RD STREET SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
233	692-I-901	83RD STREET SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
234	693-C-101	BIRMINGHAM SANITARY STN GENERAL FIBER LAYOUT PLAN	12/13/2023
235	693-C-102	BIRMINGHAM SANITARY STN FIBER LAYOUT PLAN SHEET 1 OF 5	12/13/2023
236	693-C-103	BIRMINGHAM SANITARY STN FIBER LAYOUT PLAN SHEET 2 OF 5	12/13/2023
237	693-C-104	BIRMINGHAM SANITARY STN FIBER LAYOUT PLAN SHEET 3 OF 5	12/13/2023
238	693-C-105	BIRMINGHAM SANITARY STN FIBER LAYOUT PLAN SHEET 4 OF 5	12/13/2023
239	693-C-106	BIRMINGHAM SANITARY STN FIBER LAYOUT PLAN SHEET 5 OF 5	12/13/2023
240	693-E-101	BIRMINGHAM SANITARY STN SITE PLAN	12/13/2023
241	693-E-102	BIRMINGHAM SANITARY STN FLOOR PLAN SHEET 1 OF 2	12/13/2023
242	693-E-103	BIRMINGHAM SANITARY STN FLOOR PLAN SHEET 2 OF 2	12/13/2023
243	693-I-701	BIRMINGHAM SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO WORK	12/13/2023
244	693-I-702	BIRMINGHAM SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - NEW WORK	12/13/2023
245	693-I-901	BIRMINGHAM SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
246	694-C-101	MACE ROAD SANITARY STN GENERAL FIBER LAYOUT PLAN	12/13/2023
247	694-C-102	MACE ROAD SANITARY STN FIBER LAYOUT PLAN SHEET 1 OF 2	12/13/2023
248	694-C-103	MACE ROAD SANITARY STN FIBER LAYOUT PLAN SHEET 2 OF 2	12/13/2023
249	694-E-101	MACE ROAD SANITARY STN SITE PLAN	12/13/2023
250	694-E-102	MACE ROAD SANITARY STN FLOOR PLAN	12/13/2023
251	694-I-701	MACE ROAD SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
252	694-I-901	MACE ROAD SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
253	696-C-101	WEATHERBY LAKE SAN STN GENERAL FIBER LAYOUT PLAN	12/13/2023
254	696-C-102	WEATHERBY LAKE SAN STN FIBER LAYOUT PLAN SHEET 1 OF 3	12/13/2023
255	696-C-103	WEATHERBY LAKE SAN STN FIBER LAYOUT PLAN SHEET 2 OF 3	12/13/2023
256	696-C-104	WEATHERBY LAKE SAN STN FIBER LAYOUT PLAN SHEET 3 OF 3	12/13/2023
257	696-E-101	WEATHERBY LAKE SAN STN SITE PLAN	12/13/2023
258	696-E-102	WEATHERBY LAKE SAN STN FLOOR PLAN	12/13/2023
259	696-I-701	WEATHERBY LAKE SAN STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO WORK	12/13/2023
260	696-I-702	WEATHERBY LAKE SAN STN CONTROL SYSTEM BLOCK DIAGRAM - NEW WORK	12/13/2023
261	697-C-101	PLATTE WOODS SANITARY STN GENERAL FIBER LAYOUT PLAN	12/13/2023
262	697-E-101	PLATTE WOODS SANITARY STN SITE PLAN	12/13/2023
263	697-E-102	PLATTE WOODS SANITARY STN FLOOR PLAN	12/13/2023

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264	697-I-701	PLATTE WOODS SANITARY STN CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
265	697-I-901	PLATTE WOODS SANITARY STN DEMO/NEW WORK PHOTOS	12/13/2023
266	697-I-902	PLATTE WOODS SANITARY STN COMMUNICATION PANEL LAYOUT	12/13/2023
267	699-C-101	KEMPER FLOOD STATION GENERAL FIBER LAYOUT PLAN	12/13/2023
268	699-E-101	KEMPER FLOOD STATION SITE PLAN	12/13/2023
269	699-E-102	KEMPER FLOOD STATION FLOOR PLAN	12/13/2023
270	699-I-701	KEMPER FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
271	699-I-901	KEMPER FLOOD STATION DEMO/NEW WORK PHOTOS	12/13/2023
272	699-I-902	KEMPER FLOOD STATION COMMUNICATION PANEL LAYOUT	12/13/2023
273	711-C-101	BIRMINGHAM WWTP GENERAL FIBER LAYOUT PLAN	12/13/2023
274	711-C-102	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 1 OF 14	12/13/2023
275	711-C-103	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 2 OF 14	12/13/2023
276	711-C-104	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 3 OF 14	12/13/2023
277	711-C-105	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 4 OF 14	12/13/2023
278	711-C-106	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 5 OF 14	12/13/2023
279	711-C-107	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 6 OF 14	12/13/2023
280	711-C-108	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 7 OF 14	12/13/2023
281	711-C-109	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 8 OF 14	12/13/2023
282	711-C-110	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 9 OF 14	12/13/2023
283	711-C-111	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 10 OF 14	12/13/2023
284	711-C-112	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 11 OF 14	12/13/2023
285	711-C-113	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 12 OF 14	12/13/2023
286	711-C-114	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 13 OF 14	12/13/2023
287	711-C-115	BIRMINGHAM WWTP FIBER LAYOUT PLAN SHEET 14 OF 14	12/13/2023
288	711-E-101	BIRMINGHAM WWTP SITE PLAN	12/13/2023
289	711-E-102	BIRMINGHAM WWTP OPERATIONS ROOM FLOOR PLAN	12/13/2023
290	711-E-103	BIRMINGHAM WWTP SWITCHGEAR BUILDING FLOOR PLAN	12/13/2023
291	711-I-701	BIRMINGHAM WWTP CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
292	711-I-702	BIRMINGHAM WWTP CONTROL SYSTEM BLOCK DIAGRAM – NEW WORK	12/13/2023
293	711-I-901	BIRMINGHAM WWTP OPERATIONS ROOM DEMO/NEW WORK PHOTOS	12/13/2023
294	711CR-A-101	BIRMINGHAM WWTP CR ARCHITECTURAL DEMOLITION PLAN	12/13/2023
295	711CR-A-102	BIRMINGHAM WWTP CR ARCHITECTURAL FLOOR PLAN AND SCHEDULES	12/13/2023
296	711CR-E-101	BIRMINGHAM WWTP CR ELECTRICAL DEMOLITION PLAN	12/13/2023
297	711CR-E-102	BIRMINGHAM WWTP CR ELECTRICAL LIGHTING PLAN	12/13/2023
298	711CR-E-103	BIRMINGHAM WWTP CR ELECTRICAL POWER PLAN	12/13/2023
299	711CR-H-101	BIRMINGHAM WWTP CR HVAC DEMOLITION AND FLOOR PLANS	12/13/2023
300	711CR-I-901	BIRMINGHAM WWTP CP NETWORK PANEL LAYOUT	12/13/2023
301	711CR-P-101	BIRMINGHAM WWTP CR PLUMBING FLOOR PLAN	12/13/2023
302	712CR-A-101	WESTSIDE WWTP CR ARCHITECTURAL DEMOLITION PLAN	12/13/2023
303	712CR-A-102	WESTSIDE WWTP CR ARCHITECTURAL FLOOR PLAN AND SCHEDULE	12/13/2023
304	712CR-A-103	WESTSIDE WWTP CR ARCHITECTURAL REFLECTED CEILING PLAN	12/13/2023
305	712CR-E-101	WESTSIDE WWTP CR ELECTRICAL DEMOLITION PLAN	12/13/2023
306	712CR-E-102	WESTSIDE WWTP CR ELECTRICAL LIGHTING AND POWER PLANS	12/13/2023
307	712CR-H-101	WESTSIDE WWTP CR HVAC DEMOLITION PLAN	12/13/2023
308	712CR-H-102	WESTSIDE WWTP CR HVAC FLOOR PLANS	12/13/2023

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309	715-C-101	TODD CREEK WWTP GENERAL FIBER LAYOUT PLAN	12/13/2023
310	715-C-102	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 1 OF 10	12/13/2023
311	715-C-103	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 2 OF 10	12/13/2023
312	715-C-104	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 3 OF 10	12/13/2023
313	715-C-105	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 4 OF 10	12/13/2023
314	715-C-106	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 5 OF 10	12/13/2023
315	715-C-107	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 6 OF 10	12/13/2023
316	715-C-108	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 7 OF 10	12/13/2023
317	715-C-109	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 8 OF 10	12/13/2023
318	715-C-110	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 9 OF 10	12/13/2023
319	715-C-111	TODD CREEK WWTP FIBER LAYOUT PLAN SHEET 10 OF 10	12/13/2023
320	715-E-101	TODD CREEK WWTP SITE PLAN	12/13/2023
321	718CR-A-101	ROCKY BRANCH WWTP CR ARCHITECTURAL DEMOLITION PLAN	12/13/2023
322	718CR-A-102	ROCKY BRANCH WWTP CR ARCHITECTURAL FLOOR PLAN AND SCHEDULE	12/13/2023
323	718CR-E-101	ROCKY BRANCH WWTP CR ELECTRICAL DEMOLITION PLAN	12/13/2023
324	718CR-E-102	ROCKY BRANCH WWTP CR ELECTRICAL LIGHTING AND POWER PLANS	12/13/2023
325	720CR-A-101	FISHING RIVER WWTP CR ARCHITECTURAL DEMOLITION PLAN	12/13/2023
326	720CR-A-102	FISHING RIVER WWTP CR ARCHITECTURAL FLOOR PLAN AND SCHEDULES	12/13/2023
327	720CR-E-101	FISHING RIVER WWTP CR ELECTRICAL DEMOLITION PLAN	12/13/2023
328	720CR-E-102	FISHING RIVER WWTP CR ELECTRICAL LIGHTING AND POWER PLANS	12/13/2023
329	745-C-101	KCI DE-ICING FLOOD STATION GENERAL FIBER LAYOUT PLAN	12/13/2023
330	745-E-101	KCI DE-ICING FLOOD STATION SITE PLAN	12/13/2023
331	745-E-102	KCI DE-ICING FLOOD STATION FLOOR PLAN	12/13/2023
332	745-I-701	KCI DE-ICING FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM - DEMO WORK	12/13/2023
333	745-I-702	KCI DE-ICING FLOOD STATION CONTROL SYSTEM BLOCK DIAGRAM - NEW WORK	12/13/2023
334	745-I-901	KCI DE-ICING FLOOD STATION DEMO WORK PHOTOS	12/13/2023
335	745-I-902	KCI DE-ICING FLOOD STATION NEW WORK PHOTOS	12/13/2023
336	745-I-903	KCI DE-ICING FLOOD STATION COMMUNICATION PANEL LAYOUT	12/13/2023
337	847-E-101	NORTH OAK TANK SITE PLAN	12/13/2023
338	848-C-101	EAST TANK TOWER GENERAL FIBER LAYOUT PLAN	12/13/2023
339	848-C-102	EAST TANK TOWER FIBER LAYOUT PLAN SHEET 1 OF 6	12/13/2023
340	848-C-103	EAST TANK TOWER FIBER LAYOUT PLAN SHEET 2 OF 6	12/13/2023
341	848-C-104	EAST TANK TOWER FIBER LAYOUT PLAN SHEET 3 OF 6	12/13/2023
342	848-C-105	EAST TANK TOWER FIBER LAYOUT PLAN SHEET 4 OF 6	12/13/2023
343	848-C-106	EAST TANK TOWER FIBER LAYOUT PLAN SHEET 5 OF 6	12/13/2023
344	848-C-107	EAST TANK TOWER FIBER LAYOUT PLAN SHEET 6 OF 6	12/13/2023
345	848-E-101	EAST TANK TOWER SITE PLAN	12/13/2023
346	848-E-102	EAST TANK TOWER KCPD EQUIPMENT ROOM FLOOR PLAN	12/13/2023
347	848-E-501	EAST TANK TOWER DETAILS	12/13/2023
348	848-I-701	EAST TANK TOWER CONTROL SYSTEM BLOCK DIAGRAM - DEMO/NEW WORK	12/13/2023
349	848-I-901	EAST TANK TOWER DEMO/NEW WORK PHOTOS	12/13/2023
350	848-I-902	EAST TANK TOWER ANTENNA DETAILS PANEL LAYOUT	12/13/2023
351	848-I-903	EAST TANK TOWER DATA CONCENTRATOR PANEL LAYOUT	12/13/2023



INVITATION TO BID

Project/Contract Number: **81000819/1712**

Project Title: **Wastewater SCADA System Improvements Phase 2**

The General Services Department of Kansas City, Missouri will receive sealed Bids until 2:00 PM, on February 13, 2024, at the Water Services Department, 4800 E. 63rd Street, Kansas City, Missouri 64130 for Project No. 81000819, Wastewater SCADA Improvements Phase 2. Bids will be opened after that time at that location.

City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the performance of City contracts. The goals for this specific Project are 15% MBE participation and 14% WBE participation.

Bidding Documents will be available online to all interested parties at the Kansas City, Missouri Plan Room, <http://www.kcmoplanroom.org>. All addenda will be posted at this location. Any document or plan may be viewed or downloaded from this location.

Bidders are requested to attend the virtual **mandatory Pre-Bid Conference on Wednesday, January 17, 2024, at 09:00 AM. Virtual attendance at the Pre-Bid Conference is required for all Bidders on this Project.** For this Project, the City shall not contract with a Bidder who has not attended the entire virtual Pre-Bid Conference for this Project. The virtual conference will be offered as a Teams Meeting.

The Teams Meeting information is provided below. The meeting invite can be forwarded upon request by contacting Blake Anderson at blake.w.anderson@kcmo.org or 816-513-0329. Additionally, David Elge may be contacted to request a Teams Meeting invite at David.Elge@kcmo.org or 816-513-0347.

Microsoft Teams meeting

Join on your computer, mobile app or room device

[Click here to join the meeting](#)

Meeting ID: 251 885 350 926

Passcode: 6xz4SM

[Download Teams](#) | [Join on the web](#)

Or call in (audio only)

[+1 872-212-5076,,656659798#](#) United States, Chicago

Phone Conference ID: 656 659 798#

[Find a local number](#) | [Reset PIN](#)

Project Manager: David Elge
Phone Number: 816-209-8850
E-mail: David.Elge@kcmo.org

Contract Administrator: Leona Walton
Phone Number: 816-513-0220
E-mail: Leona.Walton@kcmo.org

View all procurement and contracting opportunities at <http://www.kcmo.gov>



INSTRUCTIONS TO BIDDERS

Project/Contract Numbers: 81000817/1712

Project Title: Wastewater SCADA System Improvements Phase 2

1. Sealed Bids for **Project/Contract Nos. 81000817/1712, Wastewater SCADA System Improvements Phase 2** will be received by the General Services Department at the Water Services Department, located at 4800 E. 63rd Street, Kansas City, MO 64130 until 2:00 P.M., Tuesday, February 13, 2024 at which time bidding will be closed.
 - a. All Bids will be opened and read aloud. The Bid Envelope must contain all required submissions to be included with the Bid. No Bid may be withdrawn for a period of ninety (90) days after the Bid is opened. Bid security shall likewise continue for the same ninety (90) days unless earlier released by the City. The successful Bidder shall comply with all Bidding and contract requirements. Bids, once opened and read, may not be withdrawn without forfeiture of the Bid security.
 - b. All Bids shall be addressed to the Delois Moore, Manager of Procurement Services, shall state on the outside of the sealed Bid envelope "Bid Enclosed", title and Project number, and shall be deposited in the locked Bid box. All Bids must comply with the Bidding Requirements of Kansas City, Missouri (CITY).
2. Consideration of Bids
 - a. The City will determine the lowest, responsive and responsible Bid. The City may reject any or all bids. If the City rejects all Bids, the City may: (1) resolicit Bids following the City's normal solicitation procedure; or (2) solicit Bids only from those Bidders that submitted a Bid pursuant to the original solicitation; or (3) use an expedited Bid submission schedule with or without readvertising or issuing any other public notice when the City determines that the delay from the normal City solicitation procedure would not be in the City's best interests.
 - b. Alternates. If this solicitation includes Bid Alternates, the City, in its sole discretion, may include any, all or none of the Alternates in determining the lowest, responsive and responsible Bid. In determining lowest, responsive and responsible Bid, the City may include the Alternates in any combination and in any order or priority or choose none of the Alternates. The City may make this determination at any time after Bid Closing and prior to Contract award. The City will act in the best interest of the City in determining whether to include any, all or none of the Alternates and the combination and priority of any Alternates selected. If additional funding becomes available after Contract award, City may add any or all of the Alternates to the Contract by change order.
3. Evidence of Competency to Perform. Each bidder shall furnish with the bid satisfactory evidence of Bidder's competency to perform the proposed work. Such evidence of competency shall consist of the following:
 - a. Completed Form 00410.01 Experience Reference Summary for three projects of similar scope performed within the past 5 years including the name, address and telephone number of the contact person having knowledge of the project and the dollar value of the project.
 - b. Statement that, during the three (3) years immediately preceding the date of the Bid, Bidder has received no written notices of violations of any federal or state prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or Bidder has been found in such but has made restitution to affected workmen and complied with any statutory penalty; and a

statement that Bidder is current on payment of Federal and State income tax withholdings and unemployment insurance payments

- c. Statement that Bidder participates in a training program that facilitates entry into the construction industry and which may include an on-the-job or in-house training program. By submitting its Bid, Bidder is agreeing to timely submit during the 48 hours after Bid opening an affidavit of describing such program and Bidder's participation.
- d. Identify the following Key Personnel proposed for the Project. (**NOTE:** Key Personnel must be committed to the Project for its duration, and may not be removed or substituted without the City's prior written consent.)
 - (1) GC Project Manager
 - (2) On-Site Field Superintendent
 - (3) QC/QA Manager
 - (4) Safety Officer
- e. For each of the Key Personnel, provide the following background information.
 - (1) Years of employment with current employer
 - (2) City of residence
 - (3) Identify any other projects this person will be involved with concurrently with the Project, and state the time commitment for the Project and each other project
 - (4) Discuss professional registrations, education, certifications, and credentials held by this person that are applicable to the Project
- f. Discuss generally the tasks involved in the Project.
- g. Illustrate clearly and concisely Bidder's understanding of the technical elements that must be addressed for successful completion of the Project.
- h. Submit a bid schedule with anticipated milestones for the Project using Microsoft Project 2007 or later format.
- i. Describe key issues that might affect the Project schedule and how Bidder proposes to address them.
- j. Summary of the Project Safety Plan for the Project.
 - (1) Describe how Bidder proposes to address any unique safety issues for the Project
 - (2) Describe your safety record and environmental compliance record along with your Firm's OSHA reportable accident rates on recent comparable size projects
 - (3) Statement of Bidder's Experience Modification Ratio (EMR)
- k. Discuss Bidder's understanding of the traffic control required for the Project, if applicable, and how traffic control will impact the Project schedule. Discuss any major traffic control issues that need to be addressed and Bidder's proposed solutions.
- l. Identify any other special issues or problems that are likely to be encountered. Outline the manner in which Bidder suggests resolving them.
- m. Outline key community relations issues and how they might be resolved.
- n. Describe any difficulties Bidder anticipates encountering in serving the City, in light of the City's status as a municipality and public entity. Explain how Bidder plans to manage them.
- o. Summary of Bidder's Quality Assurance/Quality Control Plan for this project
- p. Statement regarding all work performed two (2) years immediately preceding the date of the Bid, that contains either (a) a contract by contract listing of any written notices of violations of any

federal, state or local DBE/MBE/WBE Program and any damages assessed; or (b) a statement that there have been no such written notices of violations or such penalties assessed; and a statement that Program requirements have been met.

- q. Statement that the Bidder has not been rescinded or debarred from any bidding, contractual, procurement, or other such programs by federal, state or local entities.
- r. Statement that Bidder is current on payment of Federal and State income tax withholdings and unemployment insurance payments
- s. Statement of Bidder's litigation and/or arbitration history over the past five (5) years including final ruling.
- t. Statement of Bidder's bond history over the past five (5) years including any incidences of failure to perform.
- u. MBE / WBE past project performance and compliance with participation goals in comparable size commercial projects
- v. Other.

4. Waiver of Bid Requirements The City Manager or his delegate at any time may waive any requirements imposed by this solicitation or by any City regulation when failure to grant the waiver will result in an increased cost to the City and the requirement waived would be waived for all Bidders for this solicitation and it is in the best interest of the City to grant the waiver. The City Council at any time may waive any requirements imposed in this solicitation by the City's Code of Ordinances when it finds failure to grant the waiver will result in an increased cost to the City and the waived requirement would be waived for all Bidders for this solicitation and it is in the best interest of the City to grant the waiver. The City reserves the right to waive any irregularities and/or formalities as deemed appropriate.

5. Late Bids Bids and modifications of Bids received after the exact hour and date specified for receipt will not be considered unless: (1) the Bid is sent via the U.S. Postal Service, common carrier or contract carrier, by a delivery method that guarantees the Bid will be delivered to the City prior to the submission deadline; or (2) if the Bid is submitted by mail, common carrier or contract carrier it is determined by the City that the late receipt was due solely to an error by the U.S Postal Service, common carrier or contract carrier; or (3) the Bid is timely delivered to the City but is at a different City location than that specified in this IFB; or (4) the City extends the time after the deadline for a force majeure event that could potentially affect any or all Bidders meeting the deadline.

6. Interpretations and Addenda All questions about the meaning or intent of the Bidding Documents may be directed to the Project Manager listed at the end of these Instructions to Bidders. Interpretations or clarifications considered necessary by the Project Manager in response to such questions will be issued by Addenda to all parties recorded as having received the Bidding Documents. Questions received less than ten (10) days prior to the date for opening of Bids may not be answered. Only answers issued by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. Addenda may also be issued to modify the Bidding Documents as deemed advisable by the City.

7. Bid Security Requirements All Bids submitted must be accompanied by a Bid deposit in the amount of five percent (5%) of the base Bid which shall be in the form of a Bid Bond (on the form provided in these Bidding Documents), Cashier's Check, Letter of Credit, Certificate of Deposit or other instrument approved in advance by the City. Prior to submittal of the Bid the City Treasurer must approve both the financial institution and text of a Letter of Credit. A Cashier's Check or a Certificate of Deposit shall be payable to the City Treasurer.

8. Forfeiture of Security If a Bidder fails or refuses to execute the Contract when requested by the City, any Bid security given to the City shall immediately become due and payable and forfeited to the City as liquidated damages.

9. Mistake in Bid Security By submitting a Bid, Bidder is agreeing to correct any mistakes on a Bid security submission when requested by the City. When such a mistake occurs and a Bidder fails or

refuses to correct the mistake or execute the Contract when requested by the City, any Bid security shall be forfeited to the City and the Bidder shall also be subject to debarment and damages.

10. Bids that Exceed the Engineer's Estimate The City may offer the apparent lowest, responsive and responsible Bidders the option of performing the Work for the Engineer's estimate for the Project with no changes to the Bid requirements or scope of the Project if the Bid is not more than five percent higher than the Engineer's estimate.

11. Post Bid Required Submissions The successful Bidder will be required to submit the following documents with the signed copies of the Bid Form/Contract or within the timeframes specified in the Notice of Intent to Contract letter. Copies of the City's forms that the successful Bidder will be required to sign are bound into this Project Manual for information:

- a. Properly signed, dated, and sealed Performance and Maintenance Bond and Payment Bond;
- b. Properly completed certificates of insurance;
- c. Copies of licenses required by the City to do the Work;
- d. A copy of CONTRACTOR's current Certificate of Good Standing or Fictitious Name Registration from the Missouri Secretary of State, or other acceptable proof; and

12. Indemnification – City of Kansas City. The contract documents contains a requirement that Contractor shall indemnify, defend and hold harmless the City and any of its agencies, officials, officers, or employees from and against all claims, damages, liability, losses, costs, and expenses, including reasonable attorneys' fees, arising out of or resulting from any acts or omissions in connection with the contract, caused in whole or in part by Contractor, its employees, agents, or Subcontractors, or caused by others for whom Contractor is liable, including negligent acts or omissions of the City, its agencies, officials, officers, or employees. The contract requires Contractor to obtain specified limits of insurance to insure the indemnity obligation. Contractor has the opportunity to recover the cost of the required insurance in the Contract Price by including the cost of that insurance in the Bid amount.

13. City's Buy American and Missouri Preference Policies It is the policy of the City that any manufactured goods or commodities used or supplied in the performance of any City contract or any subcontract thereto shall be manufactured or produced in the United States whenever possible. When Bids offer quality, price, conformity with specifications, term of delivery and other conditions imposed in the specifications that are equal, the City shall select the Bid that uses manufactured goods or commodities that are manufactured or produced in the United States. The City shall give preference to all commodities manufactured, produced, or grown within the State of Missouri and to all firms, corporations, or individuals doing business as Missouri firms, corporations or individuals, when quality is equal or better and delivered price is the same or less. It is the bidder's responsibility to claim these preferences.

14. Affirmative Action It is the policy of the City that any person or entity entering into a contract with the City, will employ applicants and treat employees equally without regard to their race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age. Bidder will be required to comply with the City's Affirmative Action ordinance if Bidder is awarded a contract from the City totaling more than \$300,000.00. If you have any questions regarding the City's Affirmative Action requirements, please contact CREO KC at (816) 513-1836 or visit the City's website at www.kcmo.gov.

15. Tax Clearance Bidder will be required to furnish to CITY sufficient proof from City's Commissioner of Revenue, verifying that Bidder is in compliance with the license and tax ordinances administered by City's Revenue Division as a precondition to CITY making its first payment under any CONTRACT over \$160,000.00. Bidder will also be required to obtain proof of City tax compliance from all of its Subcontractors prior to the Subcontractors performing any Work.

16. Substitutions or "Or-Equal" Items The procedure for submission of substitutions or "or-equal" items is set forth in the General Conditions and Supplementary Conditions.

17. Prevailing Wage Requirements The successful Bidder shall pay the prevailing hourly rate of wages as determined by the Missouri Annual Wage Order and/or Federal Wage Determination set forth in the Project Manual. In case of a conflict between Missouri and Federal wage rates, the higher rate shall apply.

Successful Bidder shall be required to use City's Internet web based Prevailing Wage Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided Prevailing Wage Reporting System for all applicable personnel and shall require subcontractors to submit same.

18. Contract Information Management System. Successful Bidder shall be required to use City's Internet web based Contract Information Management System/Project Management Communications Tool provided by City and protocols included in that software during the term of this Contract. Bidder/Proposer shall submit user applications to City's provided Contract Information Management System for all personnel, subcontractors or suppliers as applicable.

19. MBE/WBE Program Requirements City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the performance of City contracts. The goals for this specific Project are (15%) MBE participation and (14%) WBE participation. The City's CREO KC Forms and CREO KC Instructions for Construction Projects are incorporated into these Bidding Documents and the Contract Documents. The MBE/WBE Directory is available on the City's website at www.kcmo.gov. Please call the Civil Rights and Equal Opportunity Department at (816) 513-1836 for assistance.

Successful Bidder shall be required to use City's Internet web based MBE/WBE Program Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided MBE/WBE Program Reporting System for all applicable personnel and shall require subcontractors/subconsultants to submit same.

20. Waiver of MBE/WBE Requirements The City Council may waive any and all MBE/WBE requirements imposed by any Bidding Document or the MBE/WBE Ordinance and Contract with the lowest, responsive and responsible Bidder if the City Council determines a waiver is in the best interests of the City.

21. Forfeiture of Bid Bond for Failure to Make MBE/WBE Submissions By submitting its Bid, Bidder is agreeing to the following: (1) Bidder has made by Bid opening a good faith effort to meet the MBE/WBE goals established for the Project; or Bidder will continue to make during the 48 hours after Bid opening a good faith effort to meet the MBE/WBE goals established for the Project; and (2) Bidder will timely submit its 00450 CREO KC Construction Contractor Utilization Plan/Request for Waiver (CREO KC Form 8) and 00450.01 Letter of Intent to Subcontract for each MBE/WBE listed on the 00450 CREO KC Construction Contractor Utilization Plan/Request for Waiver; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder being debarred and forfeiting its Bid Bond.

22. Workforce Program Requirements. City desires that minorities and women have a maximum opportunity to practice their trades on city construction projects. The minimum company-wide goals are a ten percent (10%) minority workforce and two percent (2%) women workforce. The City's CREO KC Forms and CREO KC Instructions for Construction Projects are incorporated into these Bidding Documents and the Contract Documents.

Successful Bidder shall be required to use City's Internet web based Workforce Program Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided Workforce Program Reporting System for all applicable personnel and shall require subcontractors to submit same.

23. Subcontractors, Suppliers and Others

a. If the Contract Documents require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be submitted to City, the apparent lowest, responsive and responsible Bidder, and any other Bidder so requested, shall submit to City a list of all such Subcontractors, Suppliers and other persons and organizations proposed for those portions of the Work for which such identification is required. An experience statement shall accompany such list with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier or organization if requested by City.

If City has reasonable objection to any proposed Subcontractor, Supplier or other person or organization, City may request the apparent lowest, responsive and responsible Bidder to submit an acceptable substitute without an increase in Bid price.

b. By submitting its Bid, Bidder agrees that it has read and understands all the provisions of General Condition No. 6.07, Concerning Subcontractors, Suppliers and Others, and that it will comply with all those provisions including but not limited to mandatory mediation of disputes and the prohibition against paid-if-paid and paid-when-paid contract clauses. It is the City's expectation that all Subcontractors and Suppliers will be treated fairly and in good faith by the successful Bidders and that the successful Bidder will make all reasonable efforts to resolve contract disputes with a Subcontractor or Supplier in a prompt and fair manner. If the City is notified by a Subcontractor or Supplier of a contract claim with the successful Bidder, City will notify the successful Bidder and will request prompt resolution of the claim. City will provide any such Subcontractor or Supplier information regarding mandatory mediation as well as a copy of the Payment Bond. City may notify the Surety that City has taken cognizance of such claim.

c. In accordance with the Missouri Prompt Payment Act, City reserves the right to withhold payment(s) in good faith from the successful Bidder due to: i)the successful Bidder's failure to comply with any material provision of the contract; ii)third party claims filed or reasonable evidence that a claim will be filed; iii)the successful Bidder's failure to make timely payments for labor, equipment or materials; or iv)for damage to a Subcontractor or Supplier.

d. By submitting its Bid, Bidder agrees it will not deny any Subcontractor subcontracting opportunities solely because the Subcontractor is not a signatory to collective bargaining agreements with organized labor.

e. The provisions of GC 6.07 are a material term of the Contract with the City and failure by the successful Bidder to comply with the provisions of this section will be taken into consideration by City in making the determination of lowest, responsive and responsible bidder in any subsequent City contracts.

24. Pre-Bid Conference The Water Services Department will hold a virtual **mandatory** Pre-Bid Conference on Wednesday, January 17, 2024, at 09:00 AM. Virtual attendance at the Pre-Bid Conference is required for all Bidders on this Project. For this Project, the City shall not contract with a Bidder who has not attended the entire virtual Pre-Bid Conference for this Project. The virtual conference will be offered as a Teams Meeting. The Teams Meeting information is provided below. The meeting invite can be forwarded upon request by contacting Blake Anderson at blake.w.anderson@kcmo.org or 816-513-0329. Additionally, David Elge may be contacted to request a Teams Meeting invite at David.Elge@kcmo.org or 816-209-8850.

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[+1 872-212-5076,656659798#](tel:+18722125076656659798) United States, Chicago

Phone Conference ID: 656 659 798#

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25. On-Site Inspection The Project Site will be available for inspection by Bidders. Bidders visiting the Project Site shall be responsible for their own safety. Site visits will be scheduled with David Elge and will be by appointment only.

26. Signatures Each copy of the Bid Form/Contract must be signed and properly dated by the following, as applicable:

Limited Liability Company:

- a member of the limited liability Company authorized to sign on behalf of the company.

Partnership:

- a partner authorized to sign on behalf of the partnership.

Sole Proprietor:

- the proprietor.

Joint Venture:

- the parties to the Joint Venture authorized to sign on behalf of each party to the Joint Venture, or a person authorized by each party to the Joint Venture to sign on behalf of all parties to the Joint Venture.

Corporation:

- a corporate office authorized to sign on behalf of the corporation. Corporation's seal must be attached to the signature.

27. Forward all questions in writing to the following Project Manager and Contract Administrator. Questions received less than seven (7) days prior to the Bid Date may not be answered. Interpretations or clarifications considered necessary by the Project Manager in response to such questions will be issued by Addenda to all Bidders. Oral or other interpretations or clarifications shall be without legal effect, even if made at a Pre-Bid Meeting.

David Elge, Project Manager
Water Services Department
4800 E. 63rd Street
Kansas City, MO 64130
Telephone: 816-513-0347
E-mail: David.Elge@kcmo.org

Leona Walton, Contract Administration
General Services Department
4800 E 63rd Street
Kansas City, MO 64130
Phone: 816-513-0220
Email: Leona.Walton@kcmo.org



For persons with disabilities needing reasonable accommodations please contact CREO KC at 816-513-1818 or Paul Pierce at 816-513-1824. If you need to use the Relay Missouri Center call 1-800-RELAY-MO (1-800-735-2966).

CITY OF FOUNTAINS
HEART OF THE NATION



KANSAS CITY
MISSOURI

BID FORM/CONTRACT

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

1. Bidder, having examined the Bidding Documents, related documents and the Site of the Work, and being familiar with all the conditions affecting the construction of the proposed Work, including Laws and Regulations and the availability of materials and supplies, agrees, if this Bid is selected by CITY, this Bid Form/Contract will become the Contract between Bidder and CITY for Bidder to furnish all labor and materials, equipment and services necessary for the proper completion of the Work in accordance with the Contract Documents, including general construction work at the price(s) stated below, which stated sums include fees and all other charges applicable to materials, appliances, labor and all things subject to and upon which other charges may be levied.
2. Bidder agrees the Contract Documents will comprise the entire agreement between CITY and Bidder. The Contract Documents are identified in the General Conditions and are incorporated into and made part hereof this Bid Form/Contract by reference.
3. Bidder agrees that if this Bid Form/Contract is executed by CITY, Bidder's offer is accepted and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties. Bidder authorizes the CITY to fill in the Contract Price on this Bid Form/Contract in accordance with Bidder's Bid. Bidder agrees that this Bid Form/Contract may be executed in one or more counterparts, each of which will be deemed an original copy of this Bid Form/Contract and all of which, when taken together, will be deemed to constitute one and the same Bid Form/Contract. This Bid Form/Contract shall be effective upon the execution of counterparts by both parties, notwithstanding that both parties may not sign the same counterpart. The parties' signatures transmitted by facsimile or by other electronic means shall be proof of the execution of this Bid Form/Contract and shall be acceptable in a court of law. A copy of this Bid Form/Contract shall constitute an original and shall be acceptable in a court of law.

4. The Bid Price(s) shall be shown in numeric figures only.

TOTAL BASE BID IN NUMERIC FIGURES	\$ _____
ALLOWANCE NO. 1	\$100,000.00
ALLOWANCE NO. 2	\$64,581.72
TOTAL BID IN NUMERIC FIGURES	\$ _____

5. The undersigned Bidder has given CITY'S Project Manager written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the Project Manager or by the DESIGN PROFESSIONAL is acceptable to Bidder.
6. The undersigned Bidder agrees that this Bid shall remain subject to selection by CITY, and may not be withdrawn for ninety (90) days after the day Bids are opened.
7. The undersigned Bidder certifies that this Bid contains no modifications, deviations, riders or qualifications.
8. Forms 00412 Unit Prices and 00413 Allowances contain prices included in the Base Bid, and are incorporated into this Bid. Forms must be completed and returned with this Bid.

Bidder: _____

9. The undersigned Bidder acknowledges receipt of the following addenda listed by number and date appearing on each addendum:

Addendum Number	Dated	Addendum Number	Dated
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)

10. By submitting its bid, Bidder is agreeing to meet or exceed the minimum employment goals of 10% minority and 2% women during the term of its contract with the City, or request a waiver of the goals. If a waiver is requested, Bidder must establish good faith efforts towards meeting the goals as set forth in the CREO KC Instructions for Construction Contracts and the City's Construction Employment Program Ordinance (commonly known as the "Workforce Ordinance") (City Code Section 3-515). Within forty-eight (48) hours after bid opening, the construction contractor shall submit **CREO KC Employee Identification Report Form** which shall include: the name, home address, job title, sex and race/ethnicity of each person the contractor anticipates will be performing construction labor hours creditable towards the minimum workforce goals applicable to the construction contractor individually.

11. Should Bidder fail to meet or exceed the minimum employment goals or otherwise establish that Bidder is entitled to a waiver under circumstances in which Bidder has previously failed to meet or exceed the goals on one or more occasions with the twenty-four month period immediately preceding the completion of the Work under this Bid Form/Contract, Bidder may be suspended from participating, either as a contractor or subcontractor, on any future contract with the City for a period ranging from thirty days to six months as further specified in the Contract Documents. This program is distinguished from the M/WBE Program in that it is not based on company ownership but rather is based on workforce hours instead of a budgetary allocation of work.

12. By submitting its bid, Bidder warrants that if its bid should exceed \$300,000.00 and Bidder employs fifty (50) or more people, Bidder has an affirmative action program in place and will maintain the affirmative action program in place for the duration of its contract with the City. Bidder further warrants that it will comply with the affirmative action requirements contained in the General Conditions as incorporated by reference into this Bid Form/Contract.

13. Section 15 through Section 18 constitutes the Affidavit of Intended Utilization required to be submitted by Bidders.

14. By submitting its bid, Bidder is agreeing to the following: (1) Bidder has made by bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; or Bidder will continue to make during the 48 hours after bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; and (2) Bidder will timely submit its **00450 CREO KC 08 Contractor Utilization Plan/Request for Waiver** and **00450.01 Letter of Intent to Subcontract** for each MBE/WBE listed on the 00450 CREO KC HRD 08 Construction Contractor Utilization Plan/Request

Bidder: _____

for Waiver;; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE/DBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder forfeiting its bid bond.

PROJECT GOALS: **15% MBE 14% WBE _____ % DBE**

BIDDER PARTICIPATION: **_____ % MBE _____ % WBE _____ % DBE**

15. To the best of Bidder's knowledge, the following are names of certified MBEs and/or WBEs with whom Bidder, or Bidder's subcontractors, presently intend to contract with if awarded the Contract on the above project: **(All firms must currently be certified by Kansas City, Missouri Human Relations Department)**

A. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

B. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

C. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

D. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

E. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____
 Subcontract amount _____

F. Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____
 Area/Scope of work _____

Bidder: _____

Subcontract amount _____

(List additional MBE/WBEs, if any, on additional pages and attach to this form)

16. By submitting its bid, Bidder is agreeing it will identify and timely submit within 48 Hours after Bid opening those MBE/WBE subcontractors with dollar amounts and scopes of work, which apply to or exceed the MBE/WBE goals for the Project on the **00450 CREO KC 08 Contractor Utilization Plan/Request for Waiver**.

17. Bidder agrees that failure to meet or exceed the MBE/WBE Goals for the above project will require the Director of Human Relations to recommend disapproval of the bid unless the Director of the Civil Rights and Equal Opportunity (CREO KC) Department finds the Bidder established good faith efforts towards meeting the goals as set forth in the CREO KC Forms and Instructions for Construction Projects and the City's MBE/WBE Ordinance.

Business Entity Type:

- Missouri Corporation
- Foreign Corporation
- Fictitious Name Registration
- Sole Proprietor
- Limited Liability Company
- Partnership
- Joint Venture
- Other: (Specify) _____

BIDDER

Legal name & address of Bidder, person firm, partnership, corporation, or association submitting Bid:

Phone No: _____

Cell No: _____

Facsimile No: _____

Bidder's E-Mail: _____

Federal ID. No. _____

I hereby certify that I have authority to execute this document on behalf of Bidder, person, firm, partnership, corporation or association submitting Bid.

By: _____
(Signature)

(Print Name)

Title: _____

Date: _____

(Attach corporate seal if applicable)

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20__.

My Commission Expires: _____

Bidder: _____

ACCEPTANCE OF BID

CITY, by executing this Bid Form/Contract, hereby accepts Bidder's Bid and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the Parties.

CITY shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents a maximum amount of _____ Dollars, (\$ _____). The Contract Price includes:

00412 Unit Prices, included in the Bid, a copy of which is attached

00413 Allowances, included in the Bid, a copy of which is attached

By executing this Bid Form/Contract, CITY accepts Bidder's offer for the Contract Price stated above and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties

City of Kansas City, Missouri (OWNER or City)

Approved as to form:

Assistant City Attorney

I hereby certify that there is a balance, otherwise unencumbered, to the credit of the appropriation to which the foregoing expenditure is to be charged, and a cash balance, otherwise unencumbered, in the treasury, to the credit of the fund from which payment is to be made, each sufficient to meet the obligation hereby incurred.

Director of Finance

(Date)



EXPERIENCE AND REFERENCE SUMMARY

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

Firm's Legal Name	
Mailing Address	
Contact – Name & Email	
Contact – Phone & Fax	

NO.	PROJECT & LOCATION	OWNER NAME & ADDRESS CONTACT & PHONE NUMBER	PROJECT DURATION & DATE COMPLETED	\$ VALUE
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				



EXPERIENCE AND REFERENCE SUMMARY – CURRENT PROJECTS

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

Page ____ of ____

Firm's Legal Name	
Mailing Address	
Contact – Name & E-Mail	
Contact – Phone & Fax	

NO.	PROJECT & LOCATION	CONTRACT AMOUNT/ % COMPLETE	OWNER NAME & ADDRESS CONTACT & PHONE NUMBER	LENGTH, DIAMETER & MATERIAL OF CONSTRUCTION OR DESCRIPTION OF REPAIRS	START DATE
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					



LIST OF EQUIPMENT AND STAFFING AVAILABLE FOR PROJECT

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

Page ____ of ____

	EQUIPMENT AVAILABLE FOR CONSTRUCTION (OR ATTACH LIST)		STAFFING BREAKDOWN	NUMBER OF EACH CATEGORY
1.		1.	OFFICE STAFF	
2.		2.	SUPERVISORS	
3.		3.	FIELD STAFF – CREW FOREMEN	
4.		4.	FIELD STAFF – OPERATORS (NOT FOREMEN)	
5.		5.	FIELD STAFF – LABORERS (NOT FOREMEN)	
6.		6.		

SECTION 00410.04 – EQUIPMENT QUESTIONNAIRE

Bidder shall enter in the spaces provided the names of the manufacturers of equipment which Bidder proposes to furnish and shall submit this Equipment Questionnaire with its Bid. Owner will review and evaluate the information before award of the Contract.

Only one manufacturer's name shall be listed for each item of equipment. Upon award of Contract, named equipment shall be furnished. Substitutions will be permitted only if named equipment does not meet the requirements of the Contract Documents, the manufacturer is unable to meet the delivery requirements of the construction schedule, or the manufacturer is dilatory in complying with the requirements of the Contract Documents. Substitutions shall be subject to concurrence of Owner and shall be confirmed by Change Order.

Preliminary acceptance of equipment listed by manufacturer's name shall not in any way constitute a waiver of the specifications covering such equipment; final acceptance will be based on full conformity with the Contract Documents.

Failure to furnish all information requested or entering more than one manufacturer's name for any item in this Equipment Questionnaire may be cause for rejection of the Bid.

	Equipment	Manufacturer	Lead Time ¹
	Section 13510 – Computer System Hardware		
	Section 13530 – Programmable Logic Controllers		
	Section 13540 – Radio Equipment		
	Section 13570 – Panels and Appurtenances		
	Section 13590 – Process Control Network Systems		
	Section 13591 – Metallic and Fiber Optic Communication Cables and Connectors		
<u>Notes</u> 1 Time from approved submittals to delivery. Lead time shall be provided in units of “weeks.”			

END OF SECTION



UNIT PRICES

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

NOTE: IN THE EVENT OF DISCREPANCY, UNIT PRICE SHALL GOVERN.

Item No.	Unit	Quantity	Item Description:	Unit Price	Extension
1	Hour	Open	Programming hourly rate		N/A
2	Each	Open	ControlLogix 1756-L82E Processor		N/A
3	Each	Open	CompactLogix 1756-L33ERM Processor		N/A
4	Each	Open	CompactLogix 1756-L36ERM Processor		N/A
5	Each	Open	Analog Input Card - ControlLogix - 1756-IF8I and removable terminal block		N/A
6	Each	Open	Analog Input Card - CompactLogix - 1769-IF4I		N/A
7	Each	Open	Analog Output Card - ControlLogix - 1756-OF8 and removable terminal block		N/A
8	Each	Open	Analog Output Card - CompactLogix - 1769-OF4CI		N/A
9	Each	Open	Discrete Input Card - ControlLogix - 120VAC - 1756-IA16 and removable terminal block		N/A
10	Each	Open	Discrete Input Card - CompactLogix - 120VAC - 1769-IA16		N/A
11	Each	Open	Discrete Input Card - ControlLogix - 24VDC - 1756-IB16 and removable terminal block		N/A
12	Each	Open	Discrete Input Card - CompactLogix - 24VDC - 1769-IQ16		N/A
13	Each	Open	Discrete Output Card - ControlLogix - 120VAC - 1756-OA16 and removable terminal block		N/A
14	Each	Open	Discrete Output Card - CompactLogix - 120VAC - 1769-OA16		N/A
15	Each	Open	Discrete Output Card - ControlLogix - 24VDC - 1756-OB16I and removable terminal block		N/A
16	Each	Open	Discrete Output Card - CompactLogix - 24VDC - 1769-OB16		N/A
17	Each	Open	Discrete Output Card - ControlLogix - Relay - 1756-OW16I and removable terminal block		N/A
18	Each	Open	Discrete Output Card - CompactLogix - Relay - 1769-OW8I		N/A
19	Each	Open	Ethernet/IP Card - ControlLogix - 1756-EN2T		N/A
20	Each	Open	Chassis - ControlLogix - 4-Slot		N/A
21	Each	Open	Chassis - ControlLogix - 7-Slot		N/A
22	Each	Open	Chassis - ControlLogix - 10-Slot		N/A

Item No.	Unit	Quantity	Item Description:	Unit Price	Extension
23	Each	Open	Chassis - ControlLogix - 13-Slot		N/A
24	Each	Open	Chassis - ControlLogix - 17-Slot		N/A
25	Each	Open	Power Supply - ControlLogix - 1756-PA72		N/A
26	Each	Open	Power Supply - CompactLogix - 1769-PA2		N/A
27	Each	Open	DNP3 Over Ethernet Gateway - DIN-rail mounted (ProSoft Technologies PLC51-DNPS)		N/A
28	Each	Open	DNP3 Over Ethernet Master Gateway - DIN-rail mounted (ProSoft Technologies PLC51-DNPM)		N/A
29	Each	Open	Layer 3 Stratix 5400 Ethernet Switch including 2 single mode bidirectional SFPs - 1783-HMS4SG8EG4CGR		N/A
30	Each	Open	Layer 3 Stratix 5400 Ethernet Switch including 2 single mode SFPs with separate transmit and receive - 1783-HMS4SG8EG4CGR		N/A
31	Each	Open	Layer 2 DIN-rail mounted Stratix Switch including 2 single mode bidirectional SFPs - 1783-BMS10CA		N/A
32	Each	Open	Security Appliance - Fortinet FGR-70F (model to be Contractor-determined to match devices included in bid)		N/A
33	Each	Open	Firewall (provide model included in bid:_____)		N/A
34	Each	Open	Thin Client Workstation - price to include hardware (including badge scanner) and associated programming		N/A
35	Each	Open	Fiber Optic Patch Panel - wall mounted		N/A
36	Each	Open	Fiber Optic Patch Panel - DIN-rail mounted		N/A
37	Each	Open	Splice connection to main fiber trunk line		N/A
38	Each	Open	Operator Interface Terminal - (provide model included in bid:_____)		N/A
39	Each	Open	Conformal coating add for PLC and OIT component on a per unit basis		N/A
40	LF	Open	3" HDPE Conduit (material and installation)		N/A
41	LF	Open	Fiber Optic Cable (96-strand backbone single mode fiber optic cable material and installation)		N/A
42	Each	Open	Uninterruptible power supply with network management card (APC SURTA 1500XL, AP9640)		N/A

Note: May be printed, for manual fill-in, or filled in on electronic excel spreadsheet version.

Bidder: _____

CITY OF FOUNTAINS
HEART OF THE NATION



KANSAS CITY
MISSOURI

ALLOWANCE FORM

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

Allowance No.:	Allowance Description:	Allowance in Figures:
1	Project Change Allowance	\$100,000.00
2	Pre-negotiated software	\$64,581.72



BID BOND

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

Bond Number _____

KNOW ALL MEN BY THESE PRESENTS: That _____ of _____, as Principal, and _____ as Surety, hereby bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents unto KANSAS CITY, MISSOURI, a constitutionally chartered municipal corporation, as Obligee, in the sum of

_____ Dollars (\$ _____), lawful money of the United States.

WHEREAS, Principal is herewith submitting its Bid to enter into a contract with Kansas City for the above referenced project,

NOW, THEREFORE the condition of this obligation is such that if the Principal is awarded the contract the Principal will, within the time required, enter into a contract and give a good and sufficient surety bonds to secure the performance of the terms and conditions of the contract and for the prompt payment of all labor and material furnished in the prosecution thereof as required by the contract documents, then this obligation shall be void; otherwise the Principal and Surety will immediately pay unto the Obligee the full amount of this bond as liquidated damages for failure to fulfill the conditions of this obligation, but in no event shall the Surety's liability exceed the penal sum hereof.

Signed, sealed and delivered this _____ day of _____.

BIDDER AND PRINCIPAL

Name, address and facsimile number of Bidder and Principal

I hereby certify that I have authority to execute this document on behalf of Bidder and Principal.

By: _____

Title: _____

(Attach corporate seal if applicable)

SURETY

Name, address and facsimile number of Surety:

I hereby certify that (1) I have authority to execute this document on behalf of Surety; (2) Surety has an A.M. Best rating of A- or better; (3) Surety is named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (most current revision) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury; and (4) Surety is duly licensed to issue bonds in the State of Missouri and in the jurisdiction in which the Project is located.

By: _____

Title: _____

Date: _____

(Attach seal and Power of Attorney)

**CREO KC INSTRUCTIONS
FOR CONSTRUCTION CONTRACTS**

PART A. ECONOMIC EQUITY & INCLUSION GOALS--MBE/WBE PROGRAM

I. City's Economic Equity & Inclusion Goals--MBE/WBE Program.

- A. The City has adopted an Economic Equity & Inclusion Goals--Minority/Women Business Enterprise ("MBE/WBE") Program (Sections 3-421 through 3-469, Code of Ordinances) (the "Program") to implement the City's policy of supporting the fullest possible participation in City contracts and change orders of firms owned and controlled by minorities and women. Each construction contract may have an MBE and/or WBE goal for participation. An MBE or WBE goal is a numerical objective the City has set for the contract that may be awarded pursuant to these bid specifications. Goals are stated as a percentage of contract dollars. For example, if an MBE goal for a contract is 10% and a Bidder submits a bid of \$100,000, the goal for MBE participation would equal \$10,000. The specific MBE/WBE goals on this contract are set forth elsewhere in the bid specifications.
- B. These Civil Rights & Equal Opportunity Department ("CREO KC") Forms & Instructions are part of the BIDDING DOCUMENTS and CONTRACT DOCUMENTS as defined in the General Conditions. By submitting a Bid, the Bidder agrees, as a material term of the contract, to carry out the City's MBE/WBE Program by making good faith efforts to include certified MBE/WBEs in the contract work to the extent of the goals listed for the contract and to the fullest extent consistent with submitting the lowest and best bid to the City. Bidder agrees that the Program is incorporated into this document and agrees to follow the Program. Although it is not a requirement that a Bidder in fact meet or exceed both the MBE and WBE Goals, it is a requirement for approval of the Bid that a Bidder objectively demonstrate to the City that good faith efforts have been made to meet the Goals. Bidders must attempt to meet both the MBE and WBE goals and request a waiver if either is not met.
- C. The following CREO KC Forms are attached and must be used for MBE/WBE submittals:
1. Contractor Utilization Plan/Request for Waiver (CREO KC Form 8); and
 2. Letter of Intent to Subcontract (CREO KC Form 00450.01); and
 3. Timetable for MBE/WBE Utilization (CREO KC Form 10); and
 4. Request for Modification or Substitution (CREO KC Form 11); and
 5. Contractor Affidavit for Final Payment (Form 01290.14); and
 6. Subcontractor Affidavit for Final Payment (Form 01290.15).

Warning: The City only gives MBE/WBE credit for a Bidder's use of City certified MBE/WBEs. A certified MBE/WBE firm is a firm that has been certified by the City's Civil Rights & Equal Opportunity Department as such. An MBE/WBE firm must be certified before the date on which the contractor utilization plan is due. Certified MBEs and WBEs are listed in the M/W/DBE Kansas City Mo. Online Directory, which is available on the City's website at www.kcmo.org. Before a Bidder submits a bid, Bidder



should contact CREO KC and consult the directory to make sure any firm proposed for use for MBE/WBE participation has been certified.

II. Required Submissions Following Bid Opening.

A. Bidder must submit the following documents within forty-eight (48) hours of bid opening:

1. **Contractor Utilization Plan/Request for Waiver (CREO KC Form 8).** This form states a Bidder's plan to use specific certified MBE/WBEs in the performance of the contract and includes the following:
 - a. The work to be performed by each MBE/WBE and the amounts each is to be paid for the work; and
 - b. The name, address, race or ethnic origin, gender and employer identification number or social security number of each MBE/WBE that will perform the work.
 - c. An automatic request for waiver in the event Bidder has not met or exceeded the MBE and/or WBE goals for the contract but believes that it has made good faith efforts to meet or exceed the goals and desires a waiver of the goals. If a waiver is requested, CREO KC will examine the Bidder's documentation of good faith efforts and make a recommendation to grant or deny the waiver. CREO KC will recommend a waiver be granted only if the Bidder has made good faith efforts to obtain MBE/WBE participation.
2. **Letter(s) of Intent to Subcontract (CREO KC Form 00450.01).** A letter must be provided from each MBE/WBE listed on the Contractor Utilization Plan. These letters verify that the MBE/WBE has agreed to execute a formal agreement for the work and indicate the scope of work to be performed and the price agreed upon for the work.

III. Required Submission when Requested by City.

A. Bidder must submit the following documents when requested by City:

1. **Timetable for MBE/WBE Utilization (CREO KC Form 10).**
2. **Documentation of good faith efforts.**

IV. Required Monthly Submissions during term of Contract.

A. Bidder must submit the following report on a monthly basis if awarded the contract:

1. **M/WBE Monthly Utilization Report.** This report must be submitted to the Director by the 15th of each month. Failure to submit timely reports may result in delays in processing of current and future contract approvals and payment applications. The method of submission of this report is through the B2GNow Diversity Management System (B2GNow).

V. Required Submittals for Final Contract Payment.

A. Contractor must submit the following documents with its request for final payment under

the contract:

1. **Contractor Affidavit for Final Payment (Form 01290.14)**
2. **Subcontractor Affidavit(s) for Final Payment (Form 01290.15)**
3. **Final B2GNow Monthly Contract Audit Report with all payment audits confirmed.**

VI. Additional Submittals.

- A. Contractor may be required to make additional submittals during the term of the Contract, including **Request for Modification or Substitution (CREO KC Form 11)**. Refer to Section IX, Modification of the Contractor Utilization Plan or Substitution of an MBE/WBE, for additional instructions on when this form must be submitted.

VII. MBE/WBE Participation Credit.

- A. The following shall be credited towards achieving the goals:
1. The total contract dollar amount that a prime contractor has paid or is obligated to pay to a subcontractor that is a certified MBE or WBE, except as otherwise expressly provided for herein.
 2. The total contract dollar amount that a prime contractor that is a certified MBE or WBE performed itself.
 3. Sixty percent (60%) of the total dollar amount paid or to be paid by a prime contractor to obtain supplies or goods from a supplier who is a certified MBE or WBE.
 4. Ten percent (10%) of the total dollar amount paid or to be paid by a prime contractor to obtain supplies or goods from a supply broker who is a certified MBE or WBE.
 5. One hundred percent (100%) of the total dollar amount paid or to be paid by a prime contractor to a manufacturer of construction supplies who is a certified MBE or WBE.
 6. Subcontractor participation with a lower tier MBE/WBE subcontractor using one of the above methods of participation.
- B. **NO CREDIT**, however, will be given for the following:
1. Participation in a contract by a MBE or WBE that does not perform a commercially useful function as defined by the Program; and
 2. Any portion of the value of the contract that an MBE or WBE subcontractor subcontracts back to the prime contractor or any other contractor who is not a qualified MBE/WBE; and
 3. Materials and supplies used on the contract unless the MBE/WBE is responsible for negotiating the price, determining quality and quantity, ordering the materials and installing (where applicable) and paying for material itself; and
 4. Work performed by an MBE or WBE in a scope of work other than that in which the MBE or WBE is currently certified.



VIII. Methods for Securing Participation of MBE/WBEs and Good Faith Efforts.

- A. A bidder is required to make good faith efforts to achieve the MBE/WBE goals. Good faith efforts are efforts that, given all relevant circumstances, a Bidder actively and aggressively seeking to meet the goals can reasonably be expected to make. Good faith efforts must be made before the Bidder submits a Contractor Utilization Plan, in other words, within 48 hours of bid opening. However, efforts made to increase participation of MBEs and WBEs following submission of the CUP can be considered as evidence of good faith efforts to meet the goals.
- B. In evaluating good faith efforts, the Director of CREO KC will consider whether the Bidder has performed the following, along with any other relevant factors:
1. Advertised for at least 15 calendar days prior to the bid or proposal due date opportunities to participate in the contract in general circulation media, trade and professional association publications, small and minority business media, and publications of minority and women's business organizations which are included in a list along with their current contact information identified on the directory as the list of publications available to publish such advertisements, which list shall be updated by CREO KC no less than every three (3) month.
 2. Sent written notices at least fifteen (15) calendar days prior to the bid or proposal due date containing the information required in section (9) below, by certified mail, e-mail, or facsimile, to at least 80% of MBEs and WBEs which are included in a list along with their contact information identified on the directory as the list of organizations available to receive such notices, which list shall be updated by CREO KC no less than every three (3) months.
 3. Sent written notices, containing the information required by section (9) below, by certified mail, e-mail or facsimile, to at least 80% of MBEs and WBEs listed on the directory certified in the applicable scopes of work for the particular bid soliciting their participation in the contract at least 15 calendar days prior to the bid or proposal due date.
 4. Attempted to identify portions of the work for qualified MBE and/or WBE participation in order to increase the likelihood of meeting the goals, including breaking down contracts into economically feasible units that take into consideration the capacity of available MBE/WBEs appearing on the CREO KC directory.
 5. At any time prior to submission of the CUP or submittal of a request for modification of a CUP, requested assistance in achieving the goals from the Director and acted on the Director's recommendations.
 6. Conferred with certified MBEs and WBEs which inquired about or responded to the bid solicitation and explained to such MBEs and WBEs the scope and requirements of the work for which their bids or proposals were solicited, and if not all certified MBEs and WBEs in the particular scopes listed on the directory have inquired about or responded to the bid solicitation for each scope of work, then contact by certified mail, e-mail or telephone the greater of ten (10) or 80% of additional certified MBEs and WBEs in the particular scopes of work listed on the directory and offer to confer with such MBEs and WBEs for such particular scope of work and request such MBEs



and WBEs to submit a proposal.

7. Attempted to negotiate in good faith with certified MBEs and WBEs which responded to the bid solicitation or those certified MBEs and WBEs that were conferred with as contemplated in section (6) above, and other qualified MBEs and WBEs, at the option of the bidder, proposer, or contractor, as applicable, to perform specific subcontracts, not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities by the bidder, proposer, or contractor; in the event an MBE or WBE is the low bid, but rejected as unqualified, the bidder, proposer, or contractor and the director or board, as applicable, shall provide sound reasons for rejecting such MBE or WBE.
8. Attended pre-bid meeting when such meetings were indicated in the solicitation of bids or otherwise by the bidder, proposer, or contractor, as applicable or by the director provided the director provides written direction to the bidder, proposer, or contractor at the time the goals are recommended.
9. Written notices and advertisements to be provided pursuant to sections (1), (2) and (3) above shall include the following information:
 - a. The bid due date;
 - b. The name of the project;
 - c. The address or general location of the project;
 - d. The location of plans and specifications for viewing;
 - e. Contact information of the prime contractor;
 - f. A general description of the scopes of work that are the subject of the solicitation;
 - g. The goals established for the applicable contract, and if the goals are still subject to board approval, then a statement that the goals as stated are preliminary and are subject to board approval;
 - h. If the project or any portion of the project is subject to prevailing wage then a statement that all or a portion of the project will be subject to prevailing wage, as applicable; and if only a portion of the scopes are subject to prevailing wage, then identification of such scopes provided that such scopes are known as of the time of bid solicitation;
 - i. The date and time of any pre-bid meeting(s), if any, which have been scheduled by the bidder, proposer, contractor or developer as of the bid solicitation; and

Any other information deemed relevant by the bidder, proposer, contractor or developer, as applicable, or the director to the extent the director provides written direction to the bidder, proposer, contractor or developer of such additional information at the time the goals are recommended by the director. 8. Within five (5) working days after drawing the bid specifications, send certified letters, verifiable e-mails or proof of facsimiles to certified MBEs and WBEs listed in the M/W/DBE Kansas City Mo. Online Directory.



- C. A Bidder may be required to give the City documentation to prove that it made good faith efforts. The Bidder will be contacted by the City with further instructions about when this documentation must be submitted.

IX. Modification of the Contractor Utilization Plan or Substitution of an MBE/WBE.

- A. After bid opening, a Bidder or Contractor may need to substitute an MBE and/or WBE or request that the amount of MBE/WBE participation listed in its Contractor Utilization Plan be modified. Bidder or Contractor must file a **Request for Modification or Substitution (CREO KC Form 11) prior to actual substitution and within a reasonable time after learning that a modification or substitution is necessary.** The Director may approve substitutions or modifications and upon approval, the modifications and substitutions will become an amendment to the Contractor Utilization Plan. Modifications or substitutions may be approved when:
 - 1. The Director finds that the Bidder or Contractor made and provided evidence of good faith efforts to substitute the MBE/WBE listed on the Contractor Utilization Plan with other certified MBE/WBEs for the scope of work or any other scope of work in the contract; and
 - 2. The Bidder or Contractor has not attempted intentionally to evade the requirements of the program and it is in the best interests of the City to allow a modification or substitution; and
 - 3. The Director also finds one of the following:
 - a. The listed MBE/WBE is non-responsive or cannot perform; or
 - b. The listed MBE/WBE has increased its previously quoted price to the bidder, proposer or contractor without a corresponding change in the scope of the work; or
 - c. The listed MBE/WBE has committed a material default or breach of its contract with the contractor; or
 - d. Requirements of the scope of work of the contract have changed and render subcontracting not feasible or not feasible at the levels required by the goals established for the contract; or
 - e. The listed MBE/WBE is unacceptable to the contracting department; or
 - f. The listed MBE/WBE thereafter had its certification revoked; or
- B. A modification shall not be made unless the modification or substitution has first been requested and approved by the Director. Once a modification has been made, a Construction Contractor Employee Identification Report (CREO KC Form 0485.04) for the newly approved subcontractor must be submitted at least ten (10) days prior to the approved subcontractor commencing work on a City contract.

X. Appeals.

- A. In conformance with the Act, appeals may be made to the City Fairness in Construction Board or Fairness in Professional Services and Goods Board on the following:



1. The grant or denial of a Request for Waiver;
 2. Substitution for an MBE/WBE listed on a Contractor Utilization Plan;
 3. Modification of the percentage of MBE/WBE participation on a Contractor Utilization Plan;
 4. Liquidated Damages;
 5. The amount of MBE/WBE credit the Contractor may receive for MBE/WBE participation identified in the contractor utilization plan.
- B. Any appeal must be filed in writing with the Director within fifteen (15) calendar days of notice of the determination. Mailing, faxing, personal delivery or posting at CREO KC of determinations shall constitute notice. The appeal shall state with specificity why the Bidder or Contractor believes the determination is incorrect
- C. Failure to file a timely appeal shall constitute a waiver of a Bidder's or Contractor's right to appeal such determination and such person shall be estopped to deny the validity of any determination which could have been timely appealed.

XI. Access to Documents and Records.

- A. By submitting a Bid, each Bidder agrees to permit the City, its duly authorized agents or employees, access at all reasonable times to all books and business records of Bidder as may be necessary to ascertain compliance with the requirements of this document and the Act, within ten (10) calendar days of the date of the written request.
- B. All Bidders agree to cooperate with the contracting department and CREO KC in studies and surveys regarding the MBE/WBE program.

XII. Miscellaneous.

- A. A Bidder or Contractor shall bear the burden of proof with regard to all issues on appeal.
- B. In the event of any conflict between this document and the Program, the provisions of the Program shall control. The terms used in this document are defined in the Program.
- C. Oral representations are not binding on the City.
- D. The City Council may waive the requirements of this document and the Program and award the contract to the lowest and best bidder if the City Council determines a waiver is in the best interests of the City.
- E. The Director may grant extensions of time to Bidders to submit Letters of Intent to Subcontract (CREO KC Form 00450.01).

XIII. Liquidated Damages – Economic Equity & Inclusion Goals--MBE/WBE Program.

- A. If Contractor fails to achieve the MBE/WBE goals stated in its Contractor Utilization Plan, as amended, the City will sustain damages, the exact extent of which would be difficult or impossible to ascertain. Therefore, in order to liquidate those damages, the monetary difference between either (1) the amount of the MBE/WBE goals set forth in the Contractor Utilization Plan, as amended, or (2) the goals established (whichever is lower) and the amount actually paid to qualified MBEs and WBEs for performing a commercially useful function will be deducted from the Contractor's payments as



liquidated damages. In determining the amount actually paid to qualified MBEs and WBEs, no credit will be given for the portion of participation that was not approved by the Director, unless the Director determines that the Contractor acted in good faith. No deduction for liquidated damages will be made when, for reasons beyond the control of the Contractor, the MBE/WBE participation stated in the Contractor Utilization Plan, as amended and approved by the Director is not met.

PART B. CONSTRUCTION EMPLOYMENT PROGRAM REQUIREMENTS

IMPORTANT: This Part B is applicable to City construction contracts estimated by the City prior to solicitation as: (1) requiring more than 800 construction labor hours and (2) valued in excess of \$300,000.00. This program is distinguished from the M/WBE Program in that it is based on workforce hours of the Bidder and *all* its participating subcontractors rather than the actual contract value of work. The instructions herein detail the specifics related to this program. This program is in *addition* to the M/WBE program.

I. City's Construction Employment Program.

- A. The City has adopted a Construction Employment Program (Sections 3-501 through 3-525, Code of Ordinances) (the "Workforce Program" or "Program") to implement the City's policy of supporting the fullest possible utilization of minority and women workers in the construction industry.
- B. The minimum workforce goals are currently set by ordinance at 10% for minorities and 2% for women. These goals are separate from M/WBE goals. Public recognition may be provided if the bidder achieves at least twice the minimum participation.
- C. Construction contracts subject to the Workforce Program and the company-wide and project-specific workforce goals ("workforce goals") are those contracts to construct, reconstruct, improve, enlarge or alter any fixed work that is estimated by the City prior to solicitation to: (1) require more than 800 construction labor hours, (2) has estimated costs that exceed \$300,000.00, and (3) involve the expenditure of public funds.
- D. The successful bidder may meet company-wide goals by counting the bidder's utilization of minorities and women throughout the Kansas City metropolitan statistical area. In addition, the successful Bidder is responsible to ensure that it and its subcontractors cumulatively make good faith efforts to meet project-specific goals for utilization of minorities and women.
- E. These Civil Rights & Equal Opportunity Department ("CREO KC") Forms & Instructions are part of the BIDDING DOCUMENTS and CONTRACT DOCUMENTS as defined in the General Conditions. By submitting a Bid, the Bidder agrees, as a material term of the contract, to carry out the City's Construction Employment Program by making good faith efforts to utilize minority and women workers to the fullest extent consistent with submitting the lowest and best bid to the City. Bidder agrees that the Program is incorporated into this document and agrees to follow the Program. Although it is not a requirement that a Bidder in fact meet or exceed the construction employment goals to receive approval from CREO KC, a Bidder not doing so is required to



objectively demonstrate to CREO KC that good faith efforts have been made.

- F. The following reports are to be used for Construction Employment Program submittals:
1. Project Workforce Monthly Report
 2. Company-Wide Workforce Monthly Report

II. Required Submissions.

- A. Within forty-eight (48) hours after bid opening, the construction contractor shall submit the **Construction Employee Identification Report** (CREO KC Form 00485.04) and shall include: the name, home address, job title, sex and race/ethnicity of each person working for the Prime. The individuals to be listed on the form are those which the construction contractor *anticipates* will be performing construction labor hours creditable towards the minimum workforce goals applicable to the construction contractor individually.

The following circumstances also require the submission of a Construction Employee Identification Report:

- a. Prior to contract execution for those City construction contracts awarded pursuant to a request for proposals (RFP), the construction contractor shall submit a **Construction Employee Identification Report** (CREO KC Form 00485.04).
 - b. At least ten (10) days prior to the date upon which any subcontractor is to commence work under a City construction contract, the Prime shall submit a **Construction Employee Identification Report** (CREO KC Form 00485.04) for the subcontractor.
- B. The CREO KC Director has established the B2GNow Diversity Management System (“B2GNOW”) (an online reporting tool) as the preferred method for fulfilling reporting requirements of the Workforce Program. The CREO KC Director will allow paper submission in lieu of on-line submission if the on-line submission process presents a hardship to the contractor.
- C. Bidder must submit the following documents through B2GNow on a monthly basis if awarded the contract:
1. **Project Workforce Monthly Report.** This report is contract specific. This report must be submitted to the Director by the 15th of each month for the Contractor and each subcontractor. It will be utilized to report the Contractor’s own workforce compliance data with regard to the City’s construction contract. Failure to submit timely reports may result in delays in processing of current and future contract approvals and payment applications.
 2. **Company-Wide Workforce Monthly Report.** This report is not contract specific; it is used to report on the utilization of women and minorities, by trade, company-wide. This report must be submitted to the Director by the 15th of each month. It will be utilized to report the Contractor’s own workforce compliance data with regard to



every contract (both privately and publicly funded) that the Contractor has in progress throughout the Kansas City Metropolitan Statistical Area. Failure to submit timely reports may result in delays in processing of current and future contract approvals and payment applications.

III. Submittal Required for Final Contract Payment.

- A. The final Project Workforce Monthly Report(s) and Company-Wide Workforce Monthly Report must be submitted before final payment will be made and/or retainage released. Contractor shall note the submittal of the final reports by notation in the box entitled “Final Report”

IV. Methods for Securing Workforce Participation and Good Faith Efforts.

- A. A bidder is required to make good faith efforts to achieve the construction employment goals and ensure its subcontractors are making good faith efforts to achieve the construction employment goals. If a Bidder or its subcontractors will be unable to secure enough minority and female participation to meet or exceed the construction employment goals, a bidder must, within a reasonable time after so learning, request a waiver or modification of the goals by the Director of CREO KC. The Director will request evidence of the Bidder’s and its’ subcontractors’ good faith efforts to meet the goals. The Director will examine the Bidder’s request and the Bidder’s documentation of good faith efforts for itself and its subcontractors. The Director will examine the Bidder’s request and the Bidder’s documentation of good faith efforts and grant or deny a waiver or modification. The Director will grant a waiver or modification only if the Bidder has made good faith efforts to secure minority and female participation.

IMPORTANT: The Bidder’s subcontractors on a city construction contract must meet the workforce goals collectively. The bidder is responsible to ensure the subcontractors make good faith efforts to meet the workforce goals. Bidders are required to include language in its subcontracts that ensure the subcontractors make good faith efforts to meet or exceed the workforce goals.

- B. In evaluating good faith efforts, the Director will consider whether the Bidder and its subcontractors have performed the following:
 1. For those bidders that are not signatories to a collective bargaining agreement with organized labor:
 - a. Requested in writing the assistance of the Director with respect to efforts to promote the utilization of minorities and women in the workforce and acted upon the Director’s recommendations; and
 - b. Advertised in minority or women trade association newsletters and/or minority or women owned media at least 15 calendar days prior to the utilization of any construction services on the city construction contract and used terminology that sufficiently describes the work available, the pay scale, the application process, and anything else that one might reasonably be expected to be informed of relevant to the position being advertised; and
 - c. Maintained copies of each advertisement and a log identifying the publication and date of publication; and



- d. Conducted real and substantial recruitment efforts, both oral and written, targeting resident, minority and women community-based organization, schools with a significant minority student population, and training organizations serving the recruitment area; and
 - e. Established and maintained a current list of resident, minority and women recruitment sources, providing written notification to the recruitment sources of available employment opportunities, and maintained records of the notices submitted to the organizations and any responses thereto; and
 - f. Maintained a current file for the time period of the city construction contract with the name, address, and telephone number of each resident, minority and woman job applicant, the source of the referral, whether or not the person was hired, and in the event that the applicant was not hired, the reason therefore; and
 - g. Promoted the retention of minorities and women in its workforce with the goals of achieving sufficient annual hours for minorities and women to qualify for applicable benefits; and
 - h. Required by written contract that all subcontractors comply with the above efforts.
2. For those bidders that are signatories to collective bargaining agreements with organized labor:
- a. Requested in writing from each labor union representing crafts to be employed that:
 - i. the labor union make efforts to promote the utilization of residents of the City, minorities and women in the workforce; and
 - ii. the labor union identify any residents of the City, minorities and women in its membership eligible for employment; and
 - b. Collaborated with labor unions in promoting mentoring programs for journeypersons intended to assist minorities and women in increasing retention with the goals of achieving sufficient annual hours to qualify for applicable benefits; and
 - c. Maintained a current file with the name, address, and telephone number of each resident, minority and women worker identified by the labor union, whether or not the person was hired, and in the event the person was not hired, the reason therefore.
 - d. To the extent the good-faith efforts applicable to bidders that are signatories to collective bargaining agreements with organized labor conflict with the procedures implemented by the bidder in order to comply with the relevant bargaining agreement, the bidder shall substitute other procedures as may be approved by the Director in writing, in order to accomplish the purpose and intent of this section.

C. In the event workforce goals are not met or there is anticipation that goals will not be



met, a Bidder will be required to give the City documentation to prove that it and/or its subcontractors made good faith efforts. The Bidder will be contacted by the City with further instructions about when this documentation must be submitted.

V. Access to Documents and Records.

- A. By submitting a Bid, each Bidder agrees to permit the City, its duly authorized agents or employees, access at all reasonable times to all books and business records of Bidder as may be necessary to ascertain compliance with the requirements of this document and the Program, within ten (10) days of the date of the written request. Each bidder further agrees to require, if awarded the contract, that every subcontractor permit the City the same access to documents and records.
- B. All Bidders agree to cooperate with the contracting department and CREO KC in studies and surveys regarding the construction employment program.

VI. Appeals.

- A. In conformance with the Program, appeals may be made to the Construction Workforce Board on the following:
 - 1. Determinations by the Director that a contractor did not meet the construction employment goals and did not make a good faith effort to meet the goals;
 - 2. Recommendations by the Director to assess liquidated damages;
 - 3. Recommendation by the Director that a contractor be declared ineligible to receive any city construction contract for a period of time up to one year.
- B. Any appeal must be filed in writing with the Director within ten (10) working days of notice of the recommendation or determination. The appeal shall state with specificity why the Bidder or Contractor believes the recommendation or determination is incorrect.
- C. Failure to file a timely appeal shall constitute a waiver of a Bidder's or Contractor's right to appeal such determination or recommendation and such person shall be estopped to deny the validity of any order, determination, recommendation or action of CREO KC which could have been timely appealed.

VII. Miscellaneous.

- A. A Bidder or Contractor shall bear the burden of proof with regard to all issues on appeal.
- B. The successful bidder may be required to meet with the Director of CREO KC or the Director's designee for the purpose of discussing the construction employment program, the bidder's efforts to realize the goals, and any other problems and/or issues affecting the realization of the goals or the program in general.
- C. In the event of any conflict between this document and the Program, the provisions of the Program shall control. The terms used in this document are defined in the Program.
- D. Oral representations are not binding on the City.

VIII. Failure to Meet Workforce Goals

- A. If Contractor or its subcontractors fail to achieve the construction employment goals or make good faith efforts to achieve those goals without having previously obtained a

waiver or modification of those goals, the City will sustain damages, the exact extent of which would be difficult or impossible to ascertain. These damages are magnified if the failure to abide by the requirements of the Workforce Program is recurring. Therefore, if the directory finds that the contractor or subcontractor have not met, or made good faith efforts to meet, the construction employment goals for any quarter, the director may:

1. Assess liquidated damages against the construction contractor, as specified in the city construction contract;
2. Require the contractor to attend mandatory training, as specified in the construction contract;
3. Declare the contractor ineligible to receive any city construction contract or participate as a subcontractor under any city construction contract for a period of time up to six months, as specified in the construction contract.

IX. First Source Program

- A. The City has established a labor force recruiting program intended to assist contractors in identifying, interviewing and hiring qualified job applicants residing in Kansas City, Missouri. While the contractor awarded a City construction contract is not prohibited from hiring persons residing outside Kansas City, Missouri, the recruiting resource provided for herein (the “First Source Program”) must be utilized by the contractor subject to the construction employment goals as set forth in this **PART B, CONSTRUCTION EMPLOYMENT PROGRAM REQUIREMENTS**.
- B. The City utilizes the services of the Full Employment Council, Inc., to administer the First Source Program. The contractor shall contact the Full Employment Council within 48 hours of contract award, regardless of whether the contractor has any hiring needs at that time, and within 48 hours following any job vacancy which the contractor reasonably anticipates filling during the term of the City construction contract. The contractor shall comply with the First Source Program requirements as implemented by the Full Employment Council unless otherwise excused in writing by the Director of CREO KC for good cause shown. To ensure compliance with the First Source Program, the contractor shall contact those persons at the Full Employment Council responsible for administering the program, which may be identified by visiting their website at www.feckc.org and clicking on the link for KCMO First Source Hiring Program. The contractor shall not hire any individual to provide construction services on a City construction contract unless the contractor has met the requirements of the First Source Program.
- C. The contractor shall require that its subcontractors utilize the First Source Program to the same extent that the contractor is required to do so, and shall incorporate the requirements of this Section IX into every subcontract. Every subcontractor shall be required to contact the Full Employment Council within 48 hours of subcontract award, regardless of whether the subcontractor has any hiring needs at that time, and within 48 hours following any job vacancy which the subcontractor reasonably anticipates filling during the term of their subcontract on a City construction project.





CONTRACTOR UTILIZATION PLAN/REQUEST FOR WAIVER

Project Number _____

Project Title _____

(Department Project)

Department

(Bidder/Proposer)

STATE OF _____)

) ss

COUNTY OF _____)

I, _____, of lawful age and upon my oath state as follows:

1. This Affidavit is made for the purpose of complying with the provisions of the MBE/WBE submittal requirements on the above project and the MBE/WBE Program and is given on behalf of the Bidder/Proposer listed below. It sets out the Bidder/Proposer's plan to utilize MBE and/or WBE contractors on the project.
2. The project target goals are _____% MBE and _____% WBE.
3. Bidder/Proposer assures that it will utilize a minimum of the following percentages of MBE/WBE participation in the above project:

| **BIDDER/PROPOSER PARTICIPATION:** _____% MBE _____% WBE

| **POST-BID/POST-RFP ESTIMATED BUDGET:** \$ _____

4. The following are the M/WBE subcontractors whose utilization Bidder/Proposer warrants will meet or exceed the above-listed Bidder/Proposer Participation. Bidder/Proposer warrants that it will utilize the M/WBE subcontractors to provide the goods/services described in the applicable Letter(s) of Intent to Subcontract, copies of which shall collectively be deemed incorporated herein. (*All firms must currently be certified by Kansas City, Missouri*)

| Name of M/WBE Firm _____

Address _____

Telephone No. _____

I.R.S. No. _____



Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____

Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____

Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____

Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____

Name of M/WBE Firm _____
 Address _____
 Telephone No. _____
 I.R.S. No. _____

(List additional M/WBEs, if any, on additional page and attach to this form)

4. The following is a breakdown of the percentage of the total contract amount that Bidder/Proposer agrees to pay to each listed M/WBE:

MBE/WBE BREAKDOWN SHEET

MBE FIRMS:

Name of MBE Firm	Supplier/Broker/Contractor	Subcontract Amount*	Weighted Value**	% of Total Contract
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____



TOTAL MBE \$ / TOTAL MBE %: \$ _____ %

WBE FIRMS:

Name of WBE Firm	Supplier/Broker/Contractor	Subcontract Amount*	Weighted Value**	% of Total Contract
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
TOTAL WBE \$ / TOTAL WBE %:		\$ _____	_____ %	

*“Subcontract Amount” refers to the dollar amount that Bidder/Proposer has agreed to pay each M/WBE subcontractor as of the date of contracting and is indicated here solely for the purpose of calculating the percentage that this sum represents in proportion to the total contract amount. Any contract amendments and/or change orders changing the total contract amount may alter the amount due an M/WBE under their subcontract for purposes of meeting or exceeding the Bidder/Proposer participation.

**“Weighted Value” means the portion of the subcontract amount that will be credited towards meeting the Bidder/Proposer participation. See CREO KC Forms and Instructions for allowable credit and special instructions for suppliers.

- Bidder/Proposer acknowledges that the monetary amount to be paid each listed M/WBE for their work, and which is approved herein, is an amount corresponding to the percentage of the total contract amount allocable to each listed M/WBE as calculated in the MBE/WBE Breakdown Sheet. Bidder/Proposer further acknowledges that this amount may be higher than the subcontract amount listed therein as change orders and/or amendments changing the total contract amount may correspondingly increase the amount of compensation due an M/WBE for purposes of meeting or exceeding the Bidder/Proposer participation

6. Bidder/Proposer acknowledges that it is responsible for considering the effect that any change orders and/or amendments changing the total contract amount may have on its ability to meet or exceed the Bidder/Proposer participation. Bidder/Proposer further acknowledges that it is responsible for submitting a Request for Modification or Substitution if it will be unable to meet or exceed the Bidder/Proposer participation set forth herein.
7. If Bidder/Proposer has not achieved both the M/WBE goal(s) set for this Project, Bidder/Proposer hereby requests a waiver of the MBE and/or WBE goal(s) that Bidder/Proposer has failed to achieve
8. Bidder/Proposer will present documentation of its good faith efforts, a narrative summary detailing its efforts and the reasons its efforts were unsuccessful when requested by the City.
9. I hereby certify that I am authorized to make this Affidavit on behalf of the Bidder/Proposer named below and who shall abide by the terms set forth herein:

Bidder/Proposer primary contact: _____

Address: _____

Phone Number: _____

Facsimile number: _____

E-mail Address: _____

By: _____

Title: _____

Date: _____

(Attach corporate seal if applicable)

Subscribed and sworn to before me this _____ day of _____, 20____.

My Commission Expires: _____

Notary Public





LETTER OF INTENT TO SUBCONTRACT

Check one:	
Original LOI:	<input type="checkbox"/>
Updated LOI:	<input type="checkbox"/>

Project Name/Title _____
 Project Location/Number _____

PART I: Prime Contractor _____ agrees to enter into a contractual agreement with M/W/DBE Subcontractor _____ who will provide the following goods/services in connection with the above-reference contract: [Insert a brief narrative describing goods/services to be provided. Broad Categorizations (e.g., "electrical," "plumbing," etc.) or the listing of NAICS Codes in which M/W/DBE Subcontractor is certified are insufficient and may result in denial of this Letter of Intent to Subcontract.]

for an estimated amount of \$ _____ (or _____ % of the total estimated contract value.)

- M/WBE Vendor type:
- Subcontractor/manufacturer (counts as 100% of contract value towards goals)
 - Supplier (counts as 60% of the total dollar amount paid or to be paid by a prime contractor for supplies or goods towards goals)
 - Broker (counts as 10% of the total dollar amount paid or to be paid by a prime contractor for supplies or goods towards goals)

M/W/DBE Subcontractor is, to the best of Prime Contractor's knowledge, currently certified with the City of Kansas City's Civil Rights & Equal Opportunity Department to perform in the capacities indicated herein. Prime Contractor agrees to utilize M/W/DBE Subcontractor in the capacities indicated herein, and M/W/DBE Subcontractor agrees to work on the above-referenced contract in the capacities indicated herein, contingent upon award of the contract to Prime Contractor.

PART 2: This section is to be completed by the M/W/DBE subcontractor listed above. Please attach additional sheets as needed for more than one intended sub-tier contract. **IMPORTANT: Falsification of this document will result in denial and other remedies available under City Code.**

- Select one:
- The M/W/DBE Subcontractor listed above **IS NOT** subcontracting any portions of the above-stated scope of work(s). (Continue to Part 3.)
 - The M/W/DBE Subcontractor listed above **IS** subcontracting certain portions of the above stated scope of work(s) to:

(1) Company name: _____

Full address: _____
Street number and name City, State and Zip Code

Primary contact: _____
Name Phone

a) This subcontractor is (select one): MBE WBE DBE N/A

- i: If this subcontractor is an M/W/DBE certified with the City of Kansas City, Missouri, a separate Letter of Intent must be attached to this document.
- ii. If this subcontractor is NOT a certified M/W/DBE certified with the City of Kansas City, Missouri, the firm must still be listed for reporting purposes but a Letter of Intent is not required.

b) Scope of work to be performed: _____

c) The dollar value of this agreement is: _____



TIMETABLE FOR MBE/WBE UTILIZATION

(This form should be submitted to the City after contract award.)

I, _____, acting in my capacity as _____
(Name) *(Position with Firm)*
of _____, with the submittal of this Timetable, certify that
(Name of Firm)
the following timetable for MBE/WBE utilization in the fulfillment of this contract is correct and true to the best of my knowledge.

ALLOTTED TIME FOR THE COMPLETION OF THIS CONTRACT

(Check one only)

15 days	___	75 days	___	135 days	___
30 days	___	90 days	___	150 days	___
45 days	___	105 days	___	165 days	___
60 days	___	120 days	___	180 days	___
Other	_____ (Specify)				

Throughout _____ Beginning 1/3 _____
Middle 1/3 _____ Final 1/3 _____
Beginning 1/3 _____% Middle 1/3 _____% Final 1/3 _____%

PLEASE NOTE: Any changes in this timetable require approval of the Civil Rights & Equal Opportunity Department in advance of the change.

If you have any questions regarding the completion of this form, please contact the Civil Rights & Equal Opportunity Department at: (816) 513-1836.

(Signature)

(Position with Firm)

(Date)





REQUEST FOR MODIFICATION OR SUBSTITUTION

(This Form **must** be submitted to CREO KC to request substitutions for an MBE/WBE listed in the Contractor Utilization Plan or for modification of the amount of MBE/WBE participation listed in the Contractor Utilization Plan. This Form shall be an amendment to the Contractor Utilization Plan.)

BIDDER/PROPOSER/CONTRACTOR: _____

ADDRESS: _____

PROJECT NUMBER OR TITLE: _____

AMENDMENT/CHANGE ORDER NO: (if applicable) _____

Project Goals:	_____ % MBE	_____ % WBE
Contractor Utilization Plan:	_____ % MBE	_____ % WBE

1. I am the duly authorized representative of the above Bidder/Contractor/Proposer and am authorized to request this substitution or modification on behalf of the Bidder/Contractor/Proposer.

2. I hereby request that the Director of CREO KC recommend or approve: (check appropriate space(s))

a. _____ A substitution of the certified MBE/WBE firm _____,
(Name of new firm)
 to perform _____,
(Scope of work to be performed by new firm)

for the MBE/WBE firm _____ which is currently
(Name of old firm)
 listed on the Bidder's/Contractor's/Proposer's Contractor Utilization Plan to
 perform the following scope of work: _____.
(Scope of work of old firm)

b. _____ A modification of the amount of MBE/WBE participation currently listed on the Bidder's/Contractor's/Proposer's Contractor Utilization Plan from
 _____ % MBE _____ % WBE *(Fill in % of MBE/WBE Participation currently listed on Contractor Utilization Plan)*

TO

_____ % MBE _____ % WBE *(Fill in New % of MBE/WBE Participation requested for Contractor Utilization Plan)*

- c. Attach 00450.01 Letter of Intent to Subcontract letter for each new MBE/WBE to be added.
- d. Attach a copy of the most recent 00485.01 or on-line M/WBE Monthly Utilization Report

3. Bidder/Contractor/Proposer states that a substitution or modification is necessary because: (check applicable reason(s))



___The MBE/WBE listed on the Contractor Utilization Plan is non-responsive or cannot perform.

___The MBE/WBE listed on the Contractor Utilization Plan has increased its previously quoted price without a corresponding change in the scope of work.

___The MBE/WBE listed on the Contractor Utilization Plan has committed a material default or breach of its contract.

___Requirements of the scope of work of the contract have changed and make subcontracting not feasible or not feasible at the levels required by the goals established for the contract.

___The MBE/WBE listed on the Contractor Utilization Plan is unacceptable to the City contracting department.

___Bidder/Contractor/Proposer has not attempted intentionally to evade the requirements of the Act and it is in the best interests of the City to allow a modification or substitution.

4. The following is a narrative summary of the Bidder's/Contractor's/Proposer's good faith efforts exhausted in attempts to substitute the MBE/WBE firm named above which is currently listed on the Contractor Utilization Plan with other qualified, certified MBE/WBE firms for the listed scope of work or any other scope of work in the project:

5. Bidder/Proposer/Contractor will present documentation when requested by the City to evidence its good faith efforts.

Dated: _____

(Bidder/Proposer/Contractor)

By: _____
(Authorized Representative)



CREO KC MONTHLY REPORTING INSTRUCTIONS

M/WBE Monthly Utilization Report Instructions

1. MBE/WBE Reporting applies to Contracts that have approved MBE/WBE goals assigned.
2. The City will utilize a web-based MBE/WBE Reporting System in the administration of this Contract. This web-based application database is a collaboration tool selected and provided by the City, which will allow Contractors and Consultants/Subcontractors and Subconsultants to enter data and report on compliance.

Prevailing Wage Certified Payroll Report Instructions

1. Prevailing Wage Certified Payroll Report applies to Contracts that include Prevailing Wage or Davis Bacon Provisions.
2. This web-based application database is provided by the City for reporting certified payrolls and other related prevailing wage data.
3. Computer Requirements: Minimum Intel Pentium® 4 Processor 2.4 GHz or equivalent processor with 512MB of RAM; recommended Centrino Duo® Processors 1.6 GHz or equivalent with 2GB of RAM, or higher.
 - a. Computer Operation System: Windows XP, Windows Vista, or Windows 7
 - b. Web Browser: Google Chrome
 - c. Connection Speed/Minimum Bandwidth: DSL, ADSL or T1 Line for transferring a minimum of 3 Mbps Downstream and 512 Kbps Upstream
4. City will assist Contractor in providing training of personnel and Subcontractor's personnel.
5. Contractor and Subcontractors shall have the responsibility for visiting the web site and entering data in on timely basis, and as necessary to be in compliance with Prevailing Wage Requirements included in their contracts.

Workforce Monthly Report Instructions

1. Workforce Monthly Reporting only applies to Construction Contracts greater than \$300,000 and greater than 800 projected labor hours.
2. The City will utilize a web-based Reporting System in the administration of this Contract. This web-based application database is a collaboration tool selected and provided by the City, which will allow Contractors and Subcontractors to enter data and report on Workforce compliance.



M/WBE Monthly Compliance Audit Online Reporting Instructions

PRIME INSTRUCTIONS:

The Prime's responsibility is to report payments made to subcontractors for the prior month.

1. Log into B2GNow Diversity Management System (B2GNow)
2. On the Dashboard, click Contract Audits.
3. Select the specific audit that needs to be completed. Any and all money that changed hands during the month of the audit must be reported to the specific audit month.
4. To complete audit select Report 1 Subcontractor Payment. Under the actions column, select Submit Response for the specific subcontractor that needs reporting or select the Submit ALL Incomplete Records button to go to all the subcontractors to report amounts. Under the audit information answer the following questions:

Once information has been entered, select review and save. Complete same steps for all subcontractors. If there were subcontractors that did not receive a payment for the specific audit month, click the Mark Remaining Subcontractors as Zero button to mark remaining subcontractors as 0.

SUBCONTRACTOR INSTRUCTIONS:

The responsibility of the Subcontractor is to confirm payment received for specific audit month.

1. Log in to B2GNow Diversity Management System (B2GNow)
2. On the Dashboard, select Contract Audits.
3. Select the specific audit that needs to be completed.
4. To complete audit, select Confirm Payment Received. There will be two options: correct or incorrect. Select correct if payment was in fact received OR if payment was not received or amount was different select incorrect. Answer all questions and select save to complete.

NOTE: Complete one M/WBE report per project.

An email notice will be sent from our organization monthly to notify Prime & Subcontractor users of incomplete audits.



Workforce Monthly Report Forms only apply to Construction Contracts greater than \$300,000.00 with greater than 800 projected labor hours.

Workforce Monthly Report Instructions

(Instructions for online reporting)

Completing a Workforce Audit:

To report your workforce hours:

1. Log into B2GNow Diversity Management System (B2GNow)
2. Click on the red underlined number of 'Incomplete audits' under Workforce Audits
3. Click View for the incomplete audit that needs to be completed.
4. Click Fill in Audit
5. Complete the form including the Payroll Number. Select Add to Audit to report hours worked for specific Craft/Trade.

* required entry

Summary Information	
CONTRACTOR	KCMO Test Vendor Sample
PAYROLL START DATE	11/1/2021
PAYROLL END DATE	11/30/2021
PAYROLL NUMBER	<input style="width: 100%;" type="text"/>
SPECIAL STATUS	<input type="checkbox"/> No Work (all fields will be filled with zeros) <input type="checkbox"/> Suspended <input type="checkbox"/> Final

Enter values below as hours worked. There is no need to fill in zeros; all blank fields will be saved as zero.

Craft/Trade List														
Craft/Trade	Caucasian		Black/African American		Hispanic/Latino		Asian		Native American		Other/Unknown Ethnicity		Local Resident	Comments
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female		
Foreman/Supervisor														Not included in audit Add to Audit
Asbestos Worker (Journeyman)														Not included in audit Add to Audit

6. Scroll down and select review once hours have been reported.
7. Save and Certify to submit OR Save but Certify Later (to save a draft of your audit response). Audit must be certified for the workforce audit to be submitted for review. If there is an audit where no work was performed, and have 0 hours to report, select the Mark as No Work Audit button on step 4 to report 0 hours for all your employees. Select Certify & Release to Organization to complete. Mark Final for Special Status if the audit being completed is the last month of work, this will notify the system to stop generating monthly audits.

NOTE: If subcontractor has completed Workforce Audit, Prime MUST either accept audit and release to the organization or reject audit back to Subcontractor for correction.

An email notice will be sent from our organization monthly to notify Prime & Subcontractor users of incomplete audits.



**City of Kansas City, Missouri
Civil Rights & Equal Opportunity Department
Construction Contractor Employee Identification Report**

Company Name: _____
 Company Address: _____
 Company City, State, Zip: _____
 Name of Person Completing Report: _____
 Phone Number: _____
 Email: _____

Prime's Name: _____
 KCMO Project Name: _____
 KCMO Project Number: _____
 Today's Date: _____
 City Department: _____

Instructions:

- 1) Each applicable Prime Contractors **must complete this form for its company within 48 hours of bid opening**
- 2) The Civil Rights & Equal Opportunity Department strongly recommends usage of the electronic version of this form. This form may be obtained by visiting www.kcmo.gov website. The website is enabled with a "search" function on the Home page on the right corner. Select the magnifying glass and type in the search field "Contract Central". Select the first result, then click on the link to Standard City Contract Forms. Scroll down to Construction Contractor Employee Identification Report and click the link to open this document. Complete the fields in the Employee section; the Official Use Only section will automatically populate. NOTE: This form can be printed and attached to other required Bid documents.
- 3) All subcontractors shall be required to complete this form and submit to the Prime Contractor. For each subcontractor, the Prime must submit this form to City at least at least (10) days prior to the date the subcontractor shall commence work under a city construction contract.
- 4) Complete this form if you are the Prime contractor on a City construction project estimated over **\$300,000 & over 800 man hours**.
- 5) Complete this form with data from your **current construction workforce** (no office personnel).
- 6) Prime contractor is responsible to ensure subcontractor completes this form as required in #3 above.

Females		KCMO Resident		Males		KCMO Resident							
African American	0	0	#####	African American	0	0	0	Foreman/Supervisor	0	--	Operating Engineer	0	0
Asian/Pacific Islander American	0	0	#####	Asian/Pacific Islander American	0	0	0	Asbestos Worker	0	0	Painter	0	0
Caucasian American	0	0	#####	Caucasian American	0	0	0	Boilermaker	0	0	Pipe Fitter/Plumber	0	0
Hispanic/Latino American	0	0	#####	Hispanic/Latino American	0	0	0	Bricklayer	0	0	Plasterer	0	0
Native American	0	0	#####	Native American	0	0	0	Carpenter	0	0	Roofer	0	0
Other	0	0	#####	Other	0	0	0	Cement Mason	0	0	Sheet Metal	0	0
	0	0	#####		0	0	0	Electrician	0	0	Sprinkler Fitter	0	0
								Elevator Constructor	0	0	Truck Driver	0	0
								Glazier	0	0	Welder	0	0
								Iron Worker	0	0	Other	0	--
								Laborer	0	0		0	0
									0	0			

Company Name: 0

KCMO Project Name: 0

KCMO Project Number: 0

	Name		Job Title (use drop down menu)	Address	City	State	Zip Code	KCMO Resident	Gender	Ethnicity
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Company Name: 0

KCMO Project Name: 0

KCMO Project Number: 0

	Name		Job Title <i>(use drop down menu)</i>	Address	City	State	Zip Code	KCMO Resident	Gender	Ethnicity
	Last	First								
81										
82										
83										





AFFIDAVIT OF TRAINING PROGRAM

This form must be submitted with 48 hours of Bid Opening

Bidder _____

Project Title and Number _____

STATE OF MISSOURI)

) ss:

COUNTY OF _____)

After being duly sworn the person whose name and signature appears below hereby states under penalty of perjury that:

1. I am the duly authorized officer of the business indicated above ("Bidder") and I make this affidavit on behalf of Bidder.
2. Bidder certifies that it presently participates in a training program that facilitates entry into the construction industry and which may include an on-the-job or in-house training program, further described as follows:

(attach additional pages, if necessary)

3. If requested by the City, Bidder agrees to provide City further documentation of, or other information about, this training program within 48 hours of the request.
4. Bidder acknowledges that failure to submit this form to the City within 48 hours of the Bid Opening will automatically render its bid non-responsive.

I am authorized to make this Affidavit on behalf of the Bidder named below as:

_____ of _____
(Title) (Name of Bidder)

Dated: _____ By: _____
(Affiant)

Subscribed and sworn to before me this ____ day of _____, 20____.

My Commission Expires: _____
Notary Public



AFFIRMATIVE ACTION PROGRAM AFFIDAVIT
 (required for any contractor with 50 or more employees and
 a contract with the City of Kansas City, Missouri, in excess of \$300,000.00)

STATE OF _____)
) ss
 COUNTY OF _____)

On this _____ day of _____, 20____, before me appeared _____, personally known by me or otherwise proven to be the person whose name is subscribed on this affidavit and who, being duly sworn, stated as follows:

I am of sound mind, capable of making this affidavit, and personally swear or affirm that the statements made herein are truthful to the best of my knowledge. I am the _____ (title) of _____ (business entity) and I am duly authorized, directed or empowered to act with full authority on behalf of the business entity in making this affidavit.

I hereby swear or affirm that [*enter business entity name*] has an affirmative action program (the “Program”) in place and will maintain the Program for the duration of its contract with the City of Kansas City, Missouri (“City”) as required by Chapter 3 of the City’s Code of Ordinances.

I hereby additionally swear or affirm that attached hereto is a true copy of the Program.

I hereby additionally swear or affirm that the business entity shall not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 3 of the City’s Code of Ordinances.

I acknowledge that I am signing this affidavit as the free act and deed of the business entity and that I am not doing so under duress.

Affiant's signature

Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public

My Commission expires:

Civil Rights and Equal Opportunity Department Civil Rights and Wage Assurances

Non-discrimination in Employment. Contractor shall not discriminate against any employee or candidate for employment on the basis of an individual's race, hair texture or hair style associated with an individual's race, color, sex, religion, national origin, or ancestry, disability, sexual orientation, gender identity, age, or in any other manner prohibited by Chapter 38 of the City Code. Contractor shall not engage in any discrimination as prohibited by Chapter 3 of the City Code.

Ban the Box in Hiring and Promotion.

(a) Pursuant to Section 38-104, City Code Ordinances, Contractor shall not base a hiring or promotional decision on an applicant's criminal history or sentence related thereto, unless the employer can demonstrate that the employment-related decision was based on all information available including consideration of the frequency, recentness and severity of a criminal record and that the record was reasonably related to the duties and responsibilities of the position.

(b) Notwithstanding subsection (a), Contractor may inquire about an applicant's criminal history after it has been determined that the individual is otherwise qualified for the position, and only after the applicant has been interviewed for the position. Any such inquiry may be made of all applicants who are within the final selection pool of candidates from which a job will be filled.

(c) This provision shall not apply to positions where employers are required to exclude applicants with certain criminal convictions from employment due to local, state or federal law or regulation.

Title VI of the Civil Rights Act of 1964. Title VI of the Civil Rights Act of 1964 requires that no person in the United States shall, on the grounds of race, color, or national or origin (including limited English proficient individuals), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. The City of Kansas City, Missouri requires compliance with the requirements of Title VI in all of its programs and activities regardless of the funding source.

Contractor shall not discriminate on the grounds of race, color, or national or origin (including limited English proficient individuals).

Quality Services Assurance Act. If this Contract exceeds \$160,000.00, Contractor certifies Contractor will pay all employees who will work on this Contract in the city limits of Kansas City, Missouri at least \$15.00 per hour in compliance with the City's Quality Services Assurance Act,



Civil Rights and Equal Opportunity Department Civil Rights and Wage Assurances

Section 3-66, Code of Ordinances or City has granted Contractor an exemption pursuant to the Quality Services Assurance Act.

Anti-Discrimination Against Israel. If this Contract exceeds \$100,000.00 and Contractor employs at least ten employees, pursuant to Section 34.600, RSMo., by executing this Contract, Contractor certifies it is not currently engaged in and shall not, for the duration of this contract, engage in a boycott of goods or services from the State of Israel; companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel; or persons or entities doing business in the State of Israel.

Affirmative Action. If this Contract exceeds \$300,000.00 and Contractor employs fifty (50) or more people, Contractor shall comply with City's Affirmative Action requirements in accordance with the provisions of Chapter 3 of City's Code, the rules and regulations relating to those sections, and any additions or amendments thereto; in executing any Contract subject to said provisions, Contractor warrants that it has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the Contract. Contractor shall not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 3 of City's Code. Contractor shall:

- (a) Execute and submit the City of Kansas City, Missouri CREO Affirmative Action Program Affidavit warranting that the Contractor has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the Contract.
- (b) Submit, in print or electronic format, a copy of Contractor's current certificate of compliance to the City's Civil Rights and Equal Opportunity Department (CREO) prior to receiving the first payment under the Contract, unless a copy has already been submitted to CREO at any point within the previous two (2) calendar years. If, and only if, Contractor does not possess a current certification of compliance, Contractor shall submit, in print or electronic format, a copy of its affirmative action program to CREO prior to receiving the first payment under the Contract, unless a copy has already been submitted to CREO at any point within the previous two (2) calendar years.
- (c) Require any Subcontractor awarded a subcontract exceeding \$300,000.00 to affirm that Subcontractor has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the subcontract.
- (d) Obtain from any Subcontractor awarded a subcontract exceeding \$300,000.00 a copy of the Subcontractor's current certificate of compliance and tender a copy of the same, in print or



Civil Rights and Equal Opportunity Department Civil Rights and Wage Assurances

electronic format, to CREO within thirty (30) days from the date the subcontract is executed. If, and only if, Subcontractor does not possess a current certificate of compliance, Contractor shall obtain a copy of the Subcontractor's affirmative action program and tender a copy of the same, in print or electronic format, to CREO within thirty (30) days from the date the subcontract is executed.

City has the right to take action as directed by City's Civil Rights and Equal Opportunity Department to enforce this provision. If Contractor fails, refuses or neglects to comply with the provisions of Chapter 3 of City's Code, then such failure shall be deemed a total breach of this Contract and this Contract may be terminated, cancelled or suspended, in whole or in part, and Contractor may be declared ineligible for any further contracts funded by City for a period of one (1) year. This is a material term of this Contract.

Compliance with Laws. Contractor shall comply with all federal, state and local laws, ordinances and regulations applicable to the work and this Agreement. Contractor shall maintain in effect all the licenses, permissions, authorizations, consents and permits that it needs to carry out its obligations under this Agreement.

Prevailing Wage. If the Agreement exceeds \$75,000.00 and any of the Services performed by Contractor includes construction, reconstruction, improvement, enlargement, alteration, painting and decorating, or major repair, that is subject to the Missouri Prevailing Wage Law (Section 290.210, RSMo – 290.340, RSMo), Contractor shall immediately notify the City prior to performing Services so the parties can execute an agreement that incorporates, the appropriate Wage Order. Contractor shall comply with all requirements of Section 290.210, RSMo – 290.340, RSMo even if Contractor fails to notify the City.



Pre Contract Bidder's Certification

Project/Contract Number: 81000/1712

Project Title: Wastewater SCADA System Improvements Phase 2

STATE OF _____)
) SS
COUNTY OF _____)

Before me, the undersigned authority, personally appeared, who, being by me duly sworn deposed as follows:

I am authorized to make this affidavit on behalf of the named Bidder. I am of sound mind, capable of making this affidavit, and personally acquainted with the facts herein stated:

A. Bidder is current on payment of its Federal and State Income tax withholding and unemployment insurance payments, either in Missouri for companies doing business in Missouri, or in the state in which Bidder has its principal office; and

B. Bidder declares one of the following, regarding all work performed two (2) years immediately preceding the date of the Bid (check one):

Contract by contract listing of all of Bidder's written notices of violations of any Federal or State prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or paid by the Bidder (Complete and attach additional sheets if necessary):

1. _____
2. _____
3. _____

There have been no written notices of violations of any Federal or State prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or paid by the Bidder.

C. Bidder is currently in good standing with the Missouri Secretary of State or Bidder has filed a Registration of Fictitious Name with the Missouri Secretary of State.

(Bidder's Name)

(Date)

Signature of Person Making This Affidavit

In witness whereof, I have hereunto subscribed my name and affixed my official seal this ___ day of _____, 20__.



CONTRACT REQUIRED SUBMISSIONS

Project/Contract Number 81000819/1712

Project/Contract Title/Description Wastewater SCADA System Improvements
Phase 2

These instructions are to assist Contractor in providing all necessary documents to enter into a contract with the City.

MISSOURI SECRETARY OF STATE BUSINESS ENTITY REGISTRATION

- For a corporation, current Certificate of Good Standing from the Missouri Secretary of State ((816) 889-2925 or (816) 889-2926 or a web site print-out, dated no more than ninety (90) days before the date furnished to the City – One Copy.
- For a business that is not a corporation and not doing business in the exact name of the proprietor, a copy from the Secretary of State, ((816) 889-2925 or (816) 889-2926 of the filed Registration of Fictitious Name dated no more than ninety (90) days before the date furnished to the City – One Copy.

EMPLOYEE ELIGIBILITY VERIFICATION AFFIDAVIT [Required if the contract exceeds \$5,000.00]

- 00515.01 Employee Eligibility Verification Affidavit – One Executed Affidavit
- First and last pages of the E-Verify Program Memorandum of Understanding that your company has received from the U.S. Department of Homeland Security verifying enrollment in the program. For assistance, contact E-Verify Operations at 888-464-4218 – One Copy.

SUBCONTRACTORS LISTING [Applicable form provided]

- Non-Construction Subcontractors List – One Copy
- 01290.09 Subcontractors & Major Material Suppliers List – One Copy

PAYMENT BONDS (If applicable)

- Each copy of the Payment bond must be signed and properly dated by the following, as applicable:

Corporation - A corporate officer authorized to sign on behalf of the corporation and the signature must be attested by a witness to the signature; OR

Limited Liability Company - A member of the limited liability company authorized to sign on behalf of the company and a witness to the signature must attest the signature; OR

Partnership - A partner authorized to sign on behalf of the partnership and the signature must be attested by a witness to the signature; OR

Sole Proprietor - By the proprietor and the signature must be attested by a witness to the signature; OR

Joint Venture - The parties to the Joint Venture authorized to sign on behalf of each party to the Joint Venture, or a person authorized by each party to the Joint Venture to sign on behalf of all parties to the Joint Venture; AND

Surety - A person authorized by the Surety to sign on behalf of the Surety. A power of attorney issued by the Surety Company authorizing its representative to sign the Agreement must be attached to the Agreement and each copy.

PERFORMANCE AND MAINTENANCE BOND (If applicable)

- As applicable, each copy of the Performance and Maintenance bond must be signed and properly dated by:

Corporation - A corporate officer authorized to sign on behalf of the corporation and the signature must be attested by a witness to the signature; OR

Limited Liability Company - A member of the limited liability company authorized to sign on behalf of the company and a witness to the signature must attest the signature; OR

Partnership - A partner authorized to sign on behalf of the partnership and the signature must be attested by a witness to the signature; OR

Sole Proprietor - By the proprietor and the signature must be attested by a witness to the signature; OR

Joint Venture - The parties to the Joint Venture authorized to sign on behalf of each party to the Joint Venture, or a person authorized by each party to the Joint Venture to sign on behalf of all parties to the Joint Venture; AND

Surety - A person authorized by the Surety to sign on behalf of the Surety. A power of attorney issued by the Surety Company authorizing its representative to sign the Agreement must be attached to the Agreement and each copy.

CERTIFICATES OF INSURANCE [Sample form provided] - If you have any questions regarding requirements for insurance certificates, please contact the City's Risk Management Office, 816 513-1299.

- Provide a certificate of insurance for all insurance that may be required in the contract such as:
 - Commercial General Liability
 - Workers' Compensation and Employers' Liability
 - Commercial Automobile Liability
 - Railroad Protective Liability
 - Environmental Liability
 - Asbestos Liability
 - Longshoremen's Insurance
 - Property Insurance
- List the NAIC Number (National Association of Insurance Commissioners) or A.M. Best Number for each Insurer listed on the Certificate of Insurance.
- Certificate "Kansas City, Missouri" must named as an Additional Insured.
- Check the insurance requirements of the Contract. If Contract Documents require that other entities be included as additional insureds, each entity shall be listed on the certificate(s).
- Description of Operations must include Project/Contract Number and Project/Contract Title/Description as contained in the Contract Documents. The Certificate Holder and address block shall be completed as follows:

Kansas City, Missouri
Water Services Department
David Elge, Project Manager
4800 E. 63rd Street
Kansas City, Missouri 64130
- If your insurance agent prepares an ACORD form, the automobile insurance must be "any auto" or better for acceptance by the City.

AFFIRMATIVE ACTION REQUIREMENTS

- Proposed Affirmative Action Program or a copy of a Certificate of Affirmative Action Compliance – One copy.

PRE-CONTRACT BIDDER'S CERTIFICATION (Prevailing Wage Contracts; Form provided)

- Submit form 00490 - Bidder's Pre-Contract Certification (provided).

HEALTH AND SAFETY PLAN (If applicable)

- Bidder's Health and Safety Plan – One copy or one CD Rom.

EMPLOYEE ELIGIBILITY VERIFICATION AFFIDAVIT

(Required for any contract with the City of Kansas City, Missouri in excess of \$5,000.00)

STATE OF _____)
) ss
COUNTY OF _____)

On this _____ day of _____, 20___, before me appeared _____, personally known by me or otherwise proven to be the person whose name is subscribed on this affidavit and who, being duly sworn, stated as follows:

I am of sound mind, capable of making this affidavit, and personally swear or affirm that the statements made herein are truthful to the best of my knowledge. I am the _____ (title) of _____ (business entity) and I am duly authorized, directed or empowered to act with full authority on behalf of the business entity in making this affidavit.

I hereby swear or affirm that the business entity does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. § 1324a(h)(3).

I hereby additionally swear or affirm that the business entity is enrolled in an electronic verification of work program operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and Control Act of 1986, and that the business entity will participate in said program with respect to any person hired by the business entity to perform any work in connection with the contracted services. I have attached hereto documentation sufficient to establish the business entity’s enrollment and participation in the required electronic verification of work program.

I am aware and recognize that unless certain contractual requirements are satisfied and affidavits obtained as provided in Section 285.530, RSMo, the business entity may face liability for violations committed by its subcontractors, notwithstanding the fact that the business entity may itself be compliant.

I acknowledge that I am signing this affidavit as the free act and deed of the business entity and that I am not doing so under duress.

Affiant's signature

Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public

My Commission expires:

State of Missouri

EXEMPTION FROM MISSOURI SALES AND USE TAX ON PURCHASES

Issued to:

CITY OF KANSAS CITY
414 E 12TH ST 3RD FLOOR
KANSAS CITY MO 64106

Missouri Tax ID
Number: 12490466

Effective Date:
07/11/2002

Your application for sales/use tax exempt status has been approved pursuant to Section 144.030.1, RSMo. This letter is issued as documentation of your exempt status.

Purchases by your Agency are not subject to sales or use tax if within the conduct of your Agency's exempt functions and activities. When purchasing with this exemption, furnish all sellers or vendors a copy of this letter. This exemption may not be used by individuals making personal purchases.

A contractor may purchase and pay for construction materials exempt from sales tax when fulfilling a contract with your Agency only if your Agency issues a project exemption certificate and the contractor makes purchases in compliance with the provisions of Section 144.062, RSMo.

Sales by your Agency are subject to all applicable state and local sales taxes. If you engage in the business of selling tangible personal property or taxable services at retail, you must obtain a Missouri Retail Sales Tax License and collect and remit sales tax.

This is a continuing exemption subject to legislative changes and review by the Director of Revenue. If your Agency ceases to qualify as an exempt entity, this exemption will cease to be valid. This exemption is not assignable or transferable. It is an exemption from sales and use taxes only and is not an exemption from real or personal property tax.

Any alteration to this exemption letter renders it invalid.

If you have any questions regarding the use of this letter, please contact the Division of Taxation and Collection, P.O. Box 3300, Jefferson City, MO 65105-3300, phone 573-751-2836.



PERFORMANCE AND MAINTENANCE BOND

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

KNOW ALL MEN BY THESE PRESENTS: That _____, as PRINCIPAL (CONTRACTOR), and _____, (SURETY), licensed to do business as such in the State of Missouri, hereby bind themselves and their respective heirs, executors, administrators, successors, and assigns unto Kansas City, Missouri, a constitutionally chartered municipal corporation, (OWNER), as obligee, in the penal sum of _____ Dollars (\$ _____) for the payment whereof CONTRACTOR and SURETY bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

CONTRACTOR has entered into a Contract with OWNER for **Project No. 81000819/Contract No. 1712 – Wastewater SCADA System Improvements Phase 2**, which Contract, including any present or future amendment thereto, is incorporated herein by reference and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if CONTRACTOR shall promptly and faithfully perform said Contract including all duly authorized changes thereto, and including any maintenance requirements contained therein, according to all the terms thereof, including those under which CONTRACTOR agrees to pay legally required wage rates including the prevailing hourly rate of wages in the locality, as determined by the Department of Labor and Industrial Relations or by final judicial determination, for each craft or type of workman required to execute the Contract and, further, shall defend, indemnify, and hold harmless OWNER from all damages, including but not limited to, liquidated damages, loss and expense occasioned by any failure whatsoever of said CONTRACTOR and SURETY to fully comply with and carry out each and every requirement of the Contract, then this obligation shall be void; otherwise, it shall remain in full force and effect.

WAIVER. That SURETY, for value received, hereby expressly agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder, shall in any way affect the obligations of this Bond; and it does hereby waive notice of any such change, extension of time, or alteration or addition to the terms of the Contract or the Work to be performed thereunder.

IN WITNESS WHEREOF, the above parties have executed this instrument the ____ day of _____, 20__.

CONTRACTOR

Name, address and facsimile number of Contractor

I hereby certify that I have authority to execute this document on behalf of Contractor.

By: _____
Title: _____

(Attach corporate seal if applicable)

SURETY

Name, address and facsimile number of Surety:

I hereby certify that (1) I have authority to execute this document on behalf of Surety; (2) Surety has an A.M. Best rating of A-, V, or better; (3) Surety is named in the current list of "Companies Holding Certificates of Authority as Acceptable Reinsuring Companies: as published in Circular 570 (most current revision) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury; and (4) Surety is duly licensed to issue bonds in the State of Missouri and in the jurisdiction in which the Project is located.

By: _____
Title: _____
Date: _____

(Attach seal and Power of Attorney)



PAYMENT BOND

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

KNOW ALL MEN BY THESE PRESENTS: That _____, as PRINCIPAL (CONTRACTOR), and _____, (SURETY), licensed to do business as such in the State of Missouri, hereby bind themselves and their respective heirs, executors, administrators, successors, and assigns unto Kansas City, Missouri, a constitutionally chartered municipal corporation, (OWNER), as obligee, in the penal sum of _____ Dollars (\$_____) for the payment whereof CONTRACTOR and SURETY bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

CONTRACTOR has entered into a contract with OWNER for **Project No. 81000918/Contract No. 1712 – Wastewater SCADA System Improvements Phase 2**, which Contract, including any present or future amendment thereto, is incorporated herein by reference and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if in connection with the Contract, including all duly authorized modifications thereto, prompt payment shall be made to all laborers, subcontractors, teamsters, truck drivers, owners or other suppliers or for equipment employed on the job, and other claimants, for all labor performed in such work whether done for CONTRACTOR, a subcontractor, SURETY, a completion contractor or otherwise (at the full wage rates required by any law of the United States or of the State of Missouri, where applicable), for services furnished and consumed, for repairs on machinery, for equipment, tools, materials, lubricants, oil, gasoline, water, gas, power, light, heat, oil, telephone service, grain, hay, feed, coal, coke, groceries and foodstuffs, either consumed, rented, used or reasonably required for use in connection with the construction of the work or in the performance of the Contract and all insurance premiums, both for compensation and for all other kinds of insurance on the work, for sales taxes and for royalties in connection with, or incidental to, the completion of the Contract, in all instances whether the claim be directly against CONTRACTOR, against SURETY or its completion contractor, through a subcontractor or otherwise, and, further, if CONTRACTOR shall defend, indemnify and hold harmless OWNER from all such claims, demands or suits by any such person or entity, then this obligation shall be void; otherwise, it shall remain in full force and effect.

Any conditions legally required to be included in a Payment Bond on this Contract, including but not limited to those set out in §107.170 RSMo. are included herein by reference.

SURETY agrees that, in the event that CONTRACTOR fails to make payment of the obligations covered by this Bond, it will do so and, further, that within forty-five (45) days of receiving, at the address given below, a claim hereunder stating the amount claimed and the basis for the claim in reasonable detail, it (a) will send an answer to the claimant, with a copy to OWNER stating the amounts that are undisputed and the basis for challenging any amounts that are disputed, and (b) will pay any amounts that are undisputed. The amount of this Bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.

While this Bond is in force, it may be sued on at the instance of any party to whom any such payment is

due, in the name of OWNER to the use for such party. OWNER shall not be liable for the payment of any costs or expenses of any such suit.

No suit shall be commenced or pursued hereunder other than in a state court of competent jurisdiction in Jackson, Clay or Platte County, Missouri, or in the United States District Court for the Western District of Missouri.

WAIVER. That SURETY, for value received, hereby expressly agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder, shall in any way affect the obligations of this Bond; and it does hereby waive notice of any such change, extension of time, or alteration or addition to the terms of the Contract or the Work to be performed thereunder.

IN WITNESS WHEREOF, the above parties have executed this instrument the _____ day of _____, 20____.

CONTRACTOR

Name, address and facsimile number of Contractor

I hereby certify that I have authority to execute this document on behalf of Contractor.

By: _____
Title: _____

(Attach corporate seal if applicable)

SURETY

Name, address and facsimile number of Surety:

I hereby certify that (1) I have authority to execute this document on behalf of Surety; (2) Surety has an A.M. Best rating of A- or better; (3) Surety is named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (most current revision) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury; and(4) Surety is duly licensed to issue bonds in the State of Missouri and in the jurisdiction in which the Project is located.

By: _____
Title: _____
Date: _____

(Attach seal and Power of Attorney)



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER AGENT NAME AND ADDRESS	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
INSURED CONTRACTOR NAME AND ADDRESS	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	
	INSURER A :	ABC INSURANCE COMPANY
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PROJECT <input type="checkbox"/> LOC	Y	Y	POLICY NUMBER	1/1/2011	Current	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 50,000 MED EXP (Any one person) \$ 10,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000 \$
A	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO ALL OWNED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input type="checkbox"/> SCHEDULED AUTOS NON-OWNED AUTOS	Y	Y	POLICY NUMBER	1/1/2011	Current	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
A	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> EXCESS LIAB <input checked="" type="checkbox"/> RETENTION \$ 10,000 <input type="checkbox"/> OCCUR CLAIMS-MADE	Y	Y	POLICY NUMBER	1/1/2011	Current	EACH OCCURRENCE \$ 2,000,000 AGGREGATE \$ 2,000,000 \$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N	N/A	Y	POLICY NUMBER	1/1/2011	<input checked="" type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTHER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000
A	Leased/Rented/Equip. Owned Equipment Builders Risk/Installation Floater	N/A	Y	POLICY NUMBER	1/1/2011	Current	Limit; Deductible Limit; Deductible Limit; Deductible

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Project No. _____ [Title]. Certholder (City) and _____ (Design Professional) and any other entities named in 00800 SCs are named as primary, noncontributing Additional Insureds including products and completed operations, excluding workers compensation, employers liability and professional liability. Waiver of subrogation applies as allowed by law. [The policies required above shall contain no exclusions for work expressly within the subcontractors scope of work.]

CERTIFICATE HOLDER **CANCELLATION**

City of Kansas City, Missouri _____ [Department] _____ [Address] Kansas City, MO _____ [Zip]	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE
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AUTHORIZATION TO RELEASE A REVENUE CLEARANCE LETTER

Revenue Division
414 East 12th Street, 2nd floor, Room 202 W
Kansas City, MO 64106 Phone (816) 513-1135 Fax (816) 513-1077 email: revenue@kcmo.org

I authorize the City of Kansas City, Missouri, Finance Department, Revenue Division, to release a Revenue Clearance Letter for:

Name of Taxpayer: _____ Tax I.D.# _____
(PRINT)

Address: _____

Check this box and the City will send the Clearance Letter to you or the contractor designated.
 I authorize the City to provide a copy of the Taxpayer's Revenue Clearance Letter to the following:

NAME (PRINT)	BUSINESS NAME	TITLE
ADDRESS	CITY, STATE, ZIP CODE	
PHONE NUMBER	FAX NUMBER	E-MAIL ADDRESS

I authorize the City to provide the Taxpayer's Revenue Clearance Letter to all City Departments and to publish on the City's internet/intranet website that the Taxpayer is in compliance with the tax ordinances administered by the City's Commissioner of Revenue.

Please send my 1st Revenue Clearance Letter to: _____
(Print Name of City Department/Contact Person/E-mail/Fax Number)

This authorization shall expire one (1) year from the date of the signature.

The City, Commissioner of Revenue and the Revenue Division personnel (hereinafter "the City"), are hereby held harmless from any and all liability relating to unauthorized disclosure of confidential tax information resulting from release of information under all applicable confidentiality laws including federal, state, or local including any damages sustained by wrongful transmission of confidential tax information to any other person.

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS AUTHORIZATION, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT IS TRUE, CORRECT AND COMPLETE.

I hereby certify that I am the Taxpayer named herein or that I have the authority to execute this authorization and hold harmless agreement on behalf of the Taxpayer.

NAME (PRINT)	TITLE (IF APPLICABLE)	
SIGNATURE	PHONE NUMBER	DATE

A FACSIMILE OF THIS DOCUMENT SHALL CONSTITUTE AN ORIGINAL



KANSAS CITY
MISSOURI

Finance Department

Revenue Division

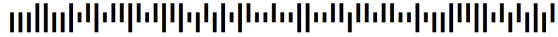
1118 Oak Street
Kansas City, MO 64106-2786

**DO NOT MAIL
atL003**

Phone: (816) 513-1120
Fax: (816) 513-1264
Email: revenue@kcmo.org
kcmo.gov/kctax

TEST TAXPAYER
414 E 12TH ST
KANSAS CITY MO 64106-2702

Letter Id: L1139040512
Date: 25-Oct-2017
Taxpayer Id: 1523670784



TAX CLEARANCE STATUS: APPROVED

As of this date, this notice is to inform you that TEST TAXPAYER is current with all taxes and license fees with the City of Kansas City, Mo., Finance Department/ Revenue Division.

Please note this could change if we perform a full review of your accounts in the future. We will let you know if we need to review your accounts. You will need to pay any amounts that are found due at that time.

Mari Ruck
Commissioner of Revenue

Visit kcmo.gov/quicktax to view the status of your account and for online filing.





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ARTICLE 1 DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

A. Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1. Addenda - Written or graphic instruments issued prior to the opening of Bids that clarify, correct or change the Bidding Requirements or the Contract Documents.

2. Agreement—The written Contract between CITY and CONTRACTOR governing the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

3. Application for Payment—The form accepted by CITY's Representative which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. Asbestos - Any material that contains more than one percent (1%) Asbestos and is friable or is releasing Asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. Bid- The offer or proposal of the Bidder submitted on the Bid Form/Contract setting forth the prices for the Work to be performed. A Bidder's Bid becomes a Contract with CITY if the CITY executes the Bid Form/Contract submitted by Bidder. If the CITY executes the Bid Form/Contract submitted by Bidder, the term "Bidder" shall mean CONTRACTOR.

6. Bidder- One who submits a Bid directly to CITY, as distinct from a sub-bidder who submits a bid to a Bidder. If the CITY executes the Bid Form/Contract submitted by Bidder, the term "Bidder" shall mean CONTRACTOR in both the Bidding Documents and Contract Documents unless the context clearly indicates otherwise.

7. Bidding Documents- The advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form/Contract, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

8. Bidding Requirements- The advertisement or invitation to bid, Instructions to Bidders, Bid security, and the Bid Form/Contract with any supplements.

9. Bonds- Payment Bond and Performance and Maintenance Bond and other instruments of security.

10. Calendar Day- Any day shown on the calendar, including Saturdays, Sundays, and holidays.

11. Change Order- A written document issued by CITY that authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Contract.

12. CITY/OWNER- Kansas City, Missouri, a constitutionally chartered municipal corporation, with which CONTRACTOR has entered into the Contract and for whom the Work is to be provided.

13. CITY's Representative- Person or agency designated to act for the Director as provided in these Contract Documents.

14. Consultant- Person, firm or corporation having a contract with CITY or DESIGN PROFESSIONAL to furnish services as an independent professional associate or Consultant with respect to the Project and who's identified as such in the Supplementary Conditions.

The Consultant(s) is identified and their seals affixed on the Certification Page(s). The certifications describe the respective responsibilities for the Drawings and Specifications prepared by the Consultant(s) and are incorporated into this Contract.

15. Contract- The entire and integrated written agreement between CITY and CONTRACTOR concerning the Work that incorporates all Contract Documents. The Bid Form/Contract submitted by Bidder is the Contract between CITY and CONTRACTOR upon execution by CITY. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

16. Contract Documents- The Contract Documents establish the rights and obligations of the parties and include the Contract, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid Form/Contract (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Intent to Contract), the HRD Construction Project Instructions, the Contractor's Utilization Plan/Request for Waiver, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Project Manual and the certification page(s) of the DESIGN PROFESSIONAL and Consultant(s), together with approved project baseline schedule and amendments thereto and all Written Amendments, Change Orders, Work Change Directives, and DESIGN PROFESSIONAL's written interpretations and clarifications issued on or after the Effective Date of the Contract, and approved Shop Drawings. Reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this Paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by CITY to CONTRACTOR are not Contract Documents, except project schedules submitted by CONTRACTOR and approved by CITY.

17. Contract Price- The money payable by CITY to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement.

18. Contract Times- The number of days or the dates stated in the Supplementary Conditions: (a) to achieve Substantial Completion, and (b) to complete the Work so that it is ready for final payment as evidenced by CITY's Representative's written recommendation of final payment.

19. CONTRACTOR- The person, firm, partnership, company, corporation or association licensed or otherwise authorized by law to do business in Missouri, with whom CITY has entered into the Agreement.

20. Day- Shall constitute a Calendar Day.

21. DESIGN PROFESSIONAL- Architect, Engineer or other licensed professional who is either employed by or has contracted with CITY to serve in a design capacity and whose Consultants, members, partners, employees or agents have prepared and sealed the Drawings and Specifications.

The DESIGN PROFESSIONAL(s) is identified and their seals affixed on the Certification Page(s). The certifications describe the respective responsibilities for the Drawings and Specifications prepared by the DESIGN PROFESSIONAL and are incorporated into this Contract.

22. DESIGN PROFESSIONAL's Project Representative- The authorized representative of DESIGN PROFESSIONAL who may be assigned to the Site or any part thereof.

23. Director- The term Director shall mean the duly appointed executive officer of a department of City who is empowered by the City Charter or by the City Council to enter into a contract on behalf of City, or to grant a permit for improvements to land owned by City. A Director is authorized to delegate this authority to a City employee so designated in writing.

24. Drawings- The drawings which graphically show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared by DESIGN PROFESSIONAL and are included in the Contract Documents. Shop Drawings are not Drawings as so defined.

25. Effective Date of the Contract- The date indicated in the Contract on which it becomes effective, but if no such date is indicated it means the date on which the Contract is fully executed by CITY.

26. General Requirements- Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

27. Hazardous Environmental Condition- The presence at the Site of Asbestos, Lead-Based Paint, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

28. Hazardous Waste- The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

29. Laws or Regulations- Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

30. Lead-Based Paint- Any paint, varnish, stain, or other applied coating that has one (1) mg or more of lead per square centimeter. The terms "leaded paint" and "lead-containing paint" are synonymous with Lead-Based Paint.

31. Liens- Liens, charges, security interests or encumbrances upon real property or personal property.

32. Milestone- A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

33. Notice of Intent to Contract- The written notice by CITY to the apparent successful Bidder stating that upon compliance by that apparent successful Bidder with the conditions in the Bid Documents enumerated, within the time specified, and upon enactment of an appropriate ordinance or resolution, CITY will sign and deliver the Contract.

34. Notice to Proceed- A written notice given by CITY to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

35. Partial Utilization- Use by CITY of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

36. PCBs- Polychlorinated biphenyls.

37. Petroleum- Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

38. Project- The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

39. Project Manual- The documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual may be issued in one or more volumes and is contained in the table(s) of contents.

40. Radioactive Material- Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

41. Samples- Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

42. Shop Drawings- All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

43. Site- Lands or areas indicated in the Contract Documents as being furnished by CITY upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by CITY which are designated for the use of CONTRACTOR.

44. Specifications- Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

45. Subcontractor- Any individual, firm, partnership, company, corporation or association licensed or otherwise authorized by law to do business in Missouri, to whom CONTRACTOR, with written notification to CITY, has entered into an agreement to perform a part of the Work.

46. Substantial Completion- When Work (or a specified part thereof) has progressed to the point where, in the opinion of DESIGN PROFESSIONAL as evidenced by DESIGN PROFESSIONAL's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

47. Supplementary Conditions- The part of the Contract Documents which amends and/or supplements these General Conditions.

48. Supplier- A manufacturer, fabricator, supplier, distributor, materialman or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated into the Work by CONTRACTOR or any Subcontractor.

49. Underground Facilities- All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. Unit Price Work- Work to be paid for on the basis of unit prices.

51. Work- The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor, and furnishing and incorporating material and equipment into the construction, and furnishing documents, all as required by the Contract Documents.

52. Work Change Directive- A written directive to CONTRACTOR, issued on or after the Effective Date of the Contract, signed by CITY and recommended by DESIGN PROFESSIONAL, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed, or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed or

documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

53. Work Day - Any day during which the CONTRACTOR is able to work a period of six (6) hours or more. Days that are not Work Days are days during which the CONTRACTOR is unable to work for a period of six (6) hours by reason of strikes, boycotts, labor disputes, embargoes, unusual delays in transportation or shortage of material, acts of God, acts of the public enemy, acts of superior governmental authority, weather conditions, riots, rebellion, sabotage, or any other circumstances for which CONTRACTOR is not responsible or which is not within its control. Saturdays, Sundays, and holidays on which the CONTRACTOR's forces engage in Work requiring the presence of an inspector, will be considered as Work Days.

54. Written Amendment- A written statement modifying the Contract Documents, signed by CITY and CONTRACTOR on or after the Effective Date of the Contract and normally dealing with the non-engineering or non-technical rather than strictly construction-related aspects of the Contract Documents.

1.02 Terminology

A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of DESIGN PROFESSIONAL as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to DESIGN PROFESSIONAL any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.08 or any other provision of the Contract Documents.

B. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to CITY 's Representative's recommendation of final payment (unless responsibility for the protection thereof has been assumed by CITY at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

C. Furnish, Install, Perform, Provide

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, “provide” is implied.

D. Unless stated otherwise in the Contract Documents, words and phrases which have a well-known technical or construction industry or trade meanings are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 PRELIMINARY MATTERS

2.01 Delivery of Bonds

A. CONTRACTOR shall deliver to CITY such Bonds as CONTRACTOR may be required to furnish.

2.02 Evidence of Insurance

A. CONTRACTOR shall deliver to CITY certificates of insurance or other evidence of insurance that CITY may request, which CONTRACTOR is required to purchase and maintain in accordance with Article 5 or any other applicable provision in the Contract Documents.

2.03 Copies of Documents

A. CITY shall furnish to CONTRACTOR one (1) copy of the Drawings and Specifications, including addenda.

2.04 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the date indicated in the Notice to Proceed.

2.05 Starting the Work

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the Site prior to the date on which the Contract Times commence to run, unless otherwise indicated in the Notice to Proceed.

2.06 Before Starting Construction

A. CONTRACTOR's Review of Contract Documents: Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to DESIGN PROFESSIONAL any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from DESIGN PROFESSIONAL before proceeding with any Work affected thereby. CONTRACTOR shall not be liable to CITY or DESIGN PROFESSIONAL for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless CONTRACTOR knew or reasonably should have known thereof.

B. Preliminary Schedules: Within ten (10) days after the Effective Date of the Contract, or on such later date as CITY's Representative shall provide in writing, CONTRACTOR shall submit to CITY's Representative for review:

1. Preliminary Project Schedule: CONTRACTOR shall submit a proposed project schedule for CITY's acceptance. The proposed project schedule shall include a detailed and comprehensive construction schedule utilizing a critical path method diagram network that (a) shows all major procurement and construction elements and phases of the Project; (b) breaks down each element or phase by trade; (c) shows early and late starts so that all float time will be accurately identified; (d) all other activities necessary for the timely completion of the Project in accordance with the scheduled dates for Substantial and Final Completion; and (e) highlights the project's critical path. CITY's acceptance is expressly limited to CITY's acknowledgement that, based upon CITY's limited review, the dates of Substantial

Completion and Milestone dates are acceptable. After final acceptance of the preliminary project schedule by the CITY, it shall be considered the project baseline schedule pursuant to Paragraph 2.07(B).

2. Preliminary schedule of Shop Drawings and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal; and

3. Preliminary 01290.02 Schedule of Values for all of the Work which will include quantities and prices of items which when added together equals the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. Preconstruction Conference: Before any Work at the Site may be started, a conference attended by CONTRACTOR, DESIGN PROFESSIONAL and others, as appropriate, will be scheduled by CITY's Representative to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.06 B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, maintaining required records, Claims process, dispute resolution or any other applicable provisions of the Contract Documents.

2.07 Acceptable Schedules

A. Acceptable schedule: The Contractor shall update and submit to the CITY for review the preliminary schedule within seven (7) Calendar Days after the Notice to Proceed.

1. The CITY shall review and make any necessary comments and/or adjustments to the updated preliminary schedule. The Contractor shall incorporate the CITY's comments and resubmit the updated preliminary schedule within seven (7) Calendar Days from receipt of the CITY's comments.

B. Project Baseline Schedule: The accepted updated preliminary schedule shall be considered the project baseline schedule and shall be used by the CONTRACTOR for planning, scheduling, managing, and executing the Work. The project baseline schedule shall not be changed without the written consent of CITY. The project baseline schedule may be further modified by the Supplemental Conditions.

C. CONTRACTOR's schedule of values will be acceptable to CITY's Representative as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 CONTRACT DOCUMENTS : INTENT, AMENDING, REUSE

3.01 Intent

A. The Contract Documents comprise the entire Contract between CITY and CONTRACTOR concerning the Work.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for at no additional cost to CITY. Clarifications and interpretations of the Contract Documents shall be issued by DESIGN PROFESSIONAL as provided in Paragraph 9.03.

C. Correlation and intent of documents: The Drawings and Specifications are intended to supplement each other. Any Work shown on the Drawings and not mentioned in the Specifications (or vice versa) shall be as binding and shall be completed the same as if mentioned or shown on both. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

1. Change Orders and Written Amendments
2. Project Baseline Schedule Requirements
3. Approved Shop Drawings
4. Addenda, with those of later date having precedence over those of earlier date
5. The Supplementary Conditions
6. The General Conditions
7. Drawings and Specifications

D. In the case of an inconsistency between Drawings and Specifications, the requirements of the Specifications shall govern. If Drawings are in conflict, larger scale details shall govern over smaller or no-scale Drawings. If Specification sections are in conflict with each other, the conflict shall be resolved by DESIGN PROFESSIONAL in accordance with reasonable interpretation of such documents.

E. The general character of the detailed Work is shown on the Drawings, but minor modifications may be made in the full size or scale details. Where the word "similar" occurs on the Drawings, it shall be used in its general sense and not as meaning identical, and all details shall be worked out in relation to their location and their connection to the other parts of the Work. Where on any Drawings a portion of the Work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to all other like portions of the Work. Where ornaments or other details are indicated by starting only, such details shall be continued throughout the courses or parts in which they occur and shall also apply to all other similar parts in the Work, unless otherwise indicated.

3.02 Reference to Standards and Specifications of Technical Societies

A. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or on the date of CONTRACTOR's proposal if there are no Bids), except as may be otherwise specifically stated in the Contract Documents.

1. No provision of any such standard, specification, manual, code or instruction of Supplier shall be effective to change the duties or responsibilities of CITY, CONTRACTOR or DESIGN PROFESSIONAL, or any of their Subcontractors, Consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to CITY or DESIGN PROFESSIONAL or any of their Consultants, agents or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies: If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Laws or Regulations applicable to the performance of the Work or of any standard, specification, manual, code or any instruction of any Supplier referred to in Paragraph 6.07, CONTRACTOR shall report it immediately to DESIGN PROFESSIONAL in writing. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by Paragraph 6.17) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to CITY or DESIGN PROFESSIONAL for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. Resolving Discrepancies. The provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and:

1. the provisions of any standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
2. the provisions of any Laws or Regulations applicable to the performance of the Work.

3.04 Amending and Supplementing Contract Documents

A. The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

1. a Written Amendment or
2. a Change Order (pursuant to Article 10), whether pursuant to a Work Change Directive or otherwise.

B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, in one or more of the following ways

1. DESIGN PROFESSIONAL's approval of a Shop Drawing or Sample (pursuant to Paragraph 6.18), or
2. DESIGN PROFESSIONAL's written interpretation or clarification (pursuant to Paragraph 9.03).

3.05 Reuse of Documents

A. CONTRACTOR and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under this Contract:

1. shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of DESIGN PROFESSIONAL or Consultant, and
2. shall not reuse any of such Drawings, Specifications, other documents or copies thereof on extensions of the Project or any other project without written consent of CITY, and of DESIGN PROFESSIONAL or Consultant, as applicable, and specific written verification or adaptation by DESIGN PROFESSIONAL or Consultant.

This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.01 Availability of Lands

A. CITY shall furnish the Site. CITY shall identify any encumbrances or restrictions not of general application but specifically related to use of lands so furnished with which CONTRACTOR will have to comply in performing the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by CITY, unless otherwise provided in the Contract Documents. If CONTRACTOR and CITY are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times or both as a result of any delay in CITY's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a Claim as provided in Article 16. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 Subsurface and Physical Conditions

A. Reports and Drawings: Reference is made to the Supplementary Conditions for identification of:

1. Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents; and
2. Physical Conditions: Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents.

B. Limited Reliance by CONTRACTOR on Technical Data Authorized: CONTRACTOR may rely upon the general accuracy of the technical data contained in reports and drawings of subsurface or physical conditions, but such reports and drawings are not Contract Documents. The technical data is identified in the Supplementary Conditions. Except for reliance on such technical data, CONTRACTOR may not rely upon or make any Claim against CITY, DESIGN PROFESSIONAL or any Consultant with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or
3. any CONTRACTOR interpretation of or conclusion drawn from any technical data or any such other data, interpretations, opinions or information.

4.03 Differing Subsurface or Physical Conditions

A. Notice of Differing Subsurface or Physical Conditions. If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any technical data on which CONTRACTOR is entitled to rely as provided in Paragraphs 4.02 A and 4.02 B is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.17), notify CITY and DESIGN PROFESSIONAL in writing about such condition(s). CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. DESIGN PROFESSIONAL's Review: After receipt of notice as required by Paragraph 4.03 A, DESIGN PROFESSIONAL will promptly review the pertinent conditions, determine the necessity for CITY to obtain additional exploration or tests with respect thereto and notify CITY in writing (with a copy to CONTRACTOR) of DESIGN PROFESSIONAL's findings and conclusions.

C. Possible Contract Documents Change: If CITY concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in Paragraph 4.03 A, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

D. Possible Price or Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of a subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

1. the condition must meet any one or more of the categories described in Paragraphs 4.03 A.1 through 4.03 A.4, inclusive;
2. a change in the Contract Documents pursuant to Paragraph 4.03 C will not be an automatic authorization of, nor a condition precedent to, entitlement to any such adjustments;
3. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.06 and 11.04; and
4. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if;
 - a. CONTRACTOR knew, or by the exercise of ordinary care could have known, of such conditions at the time CONTRACTOR made a final commitment to CITY with respect to Contract Price and Contract Times by the submission of a Bid; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or
 - c. CONTRACTOR failed to give the written notice as required by Paragraph 4.03 A.

E. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price pursuant to Article 11 and/or Contract Times pursuant to Article 12, a Claim may be made therefore as provided in Article 16. However, CITY, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04. Physical Conditions – Underground Facilities

A. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to CITY or DESIGN PROFESSIONAL by the owners of such Underground Facilities or by others.

1. CITY and DESIGN PROFESSIONAL shall not be responsible for the accuracy or completeness of any such information or data; and
2. The cost of all of the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for:
 - a. reviewing and checking all such information and data,
 - b. locating all Underground Facilities shown or indicated in the Contract Documents,
 - c. coordination of the Work with the owners of such Underground Facilities during construction, and
 - d. the safety and protection of all such Underground Facilities as provided in Paragraph 6.14 and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated: If an Underground Facility is uncovered or revealed at or contiguous to the Site, and was not shown or indicated in the Contract Documents, or was

shown or indicated incorrectly in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.17), identify the owner of such Underground Facility and give written notice to that owner and to CITY and DESIGN PROFESSIONAL.

C. DESIGN PROFESSIONAL's Review: After receipt of notice as required by Paragraph 4.04 B, DESIGN PROFESSIONAL will promptly review the consequences of the existence of the Underground Facility and notify CITY in writing (with a copy to CONTRACTOR) of DESIGN PROFESSIONAL's findings and conclusions.

D. Possible Contract Documents Change: If CITY concludes that a change in the Contract Documents is required as a result of the existence of an Underground Facility that either was not shown, or was shown incorrectly, in the Contract Documents, a Work Change Directive or Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

E. Possible Price or Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of the Underground Facility causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

1. a change in the Contract documents pursuant to Paragraph 4.04 D will not be an automatic authorization of, nor a condition precedent to, entitlement to any such adjustments;
2. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.06 and 11.04; and
3. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if;
 - a. CONTRACTOR knew, or by the exercise of ordinary care could have known, of the existence of the Underground Facility at the time CONTRACTOR made a final commitment to CITY with respect to Contract Price and Contract Times by the submission of a Bid; or
 - b. the existence of the Underground Facility could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or
 - c. CONTRACTOR failed to give the written notice as required by Paragraph 4.04 B.

F. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price pursuant to Article 11 and/or Contract Times pursuant Article 12, a Claim may be made therefore as provided in Article 16. However, CITY, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.05 Reference Points

A. CITY shall provide engineering surveys to establish reference points for construction that in DESIGN PROFESSIONAL's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of CITY. CONTRACTOR shall report to DESIGN PROFESSIONAL whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be

responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 Asbestos, Lead-Based Paint, PCBs, Petroleum, Hazardous Waste or Radioactive Material

A. Reports and Drawings: Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the DESIGN PROFESSIONAL in the preparation of the Contract Documents.

B. Limited Reliance by CONTRACTOR on Technical Data Authorized: CONTRACTOR may rely upon the general accuracy of the technical data contained in reports and drawings relating to a Hazardous Environmental Condition at the Site, but such reports and drawings are not Contract Documents. Such technical data is identified in the Supplementary Conditions. Except for such reliance on such technical data, CONTRACTOR may not rely upon or make any Claim against CITY, DESIGN PROFESSIONAL or any Consultant with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
3. any CONTRACTOR interpretation of or conclusion drawn from any technical data or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for all Hazardous Environmental Conditions created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible. CONTRACTOR shall not be entitled to an extension of the Contract Times or an increase in the Contract Price if CONTRACTOR, Subcontractor, Supplier or anyone for whom CONTRACTOR is responsible created any Hazardous Environmental Condition at the Site or in connection with the Work.

D. If CONTRACTOR encounters a Hazardous Environmental Condition at the Site or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition at the Site, CONTRACTOR shall immediately:

1. secure or otherwise isolate such condition;
2. stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6. 15); and
3. notify CITY and DESIGN PROFESSIONAL (and promptly thereafter confirm such notice in writing). CITY shall promptly consult with DESIGN PROFESSIONAL concerning the necessity for CITY to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall neither resume Work nor be required to resume Work in connection with such condition or in any affected area until after CITY has obtained any required permits related thereto and delivered to CONTRACTOR written notice:

1. specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or
2. specifying any special conditions under which such Work may be resumed safely. If CITY and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price pursuant to Article 11 and/or Contract Times to

pursuant to Article 12 as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, a Claim may be made therefore as provided in Article 16.

F. If after receipt of written notice as required in Paragraph 4.06 E, CONTRACTOR does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under special conditions specified in the notice, then CITY may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If CITY and CONTRACTOR cannot agree as to entitlement to or magnitude of an equitable adjustment in Contract Price pursuant to Article 11 and/or Contract Times pursuant to Article 12 as a result of deleting such portion of the Work, then a Claim may be made therefore as provided in Article 16. CITY may have such deleted portion of the Work performed by CITY's own forces or others in accordance with Article 7.

G. The provisions of Paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

H. All materials used, whether new or salvaged, shall be asbestos-free materials. CONTRACTOR shall immediately call to the attention of the CITY's Representative any specified material or product which the CONTRACTOR knows or suspects to contain asbestos, whether new or salvaged.

ARTICLE 5 BONDS AND INSURANCE

5.01 Performance, Payment and Other Bonds

A. CONTRACTOR shall furnish Performance and Maintenance and Payment Bonds, each in an amount at least equal to the Contract Price, as set out in the Contract Documents, as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one (1) year after the date when final payment of the Contract becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations. A certified copy of the agent's authority to act must accompany all Bonds signed by an agent.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirement of Paragraph 5.01 B, CONTRACTOR shall within twenty (20) days thereafter substitute another Bond and surety, both of which must be acceptable to CITY.

5.02 Licensed Sureties and Insurers

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by CITY or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed in the State of Missouri and in the jurisdiction in which the Project is located, if not in Missouri, to issue Bonds or insurance policies for the limits and coverages so required. All surety and insurance companies shall hold an A.M. Best rating of A-, V, or better.

5.03 Certificates of Insurance

A. CONTRACTOR shall deliver to CITY and DESIGN PROFESSIONAL, prior to the start of any Work at the Project Site, properly completed certificates of insurance or other evidence that the required insurance is in full force and effect, in a form acceptable to CITY. The receipt or acceptance of a certificate of insurance that does not incorporate the required terms and coverage shall not constitute a waiver by the City of the insurance requirements contained in the Contract Documents.

B. All policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained by CONTRACTOR in accordance with Paragraphs 5.04 and 5.06 will contain waiver provisions in accordance with Paragraph 5.07 A. The certificates of insurance will contain a provision stating that should any of the policies described in the certificate be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions.

C. If the coverage afforded is cancelled or changed or its renewal is refused, CONTRACTOR shall give at least thirty (30) days prior written notice to CITY and to each other additional insured to whom a certificate of insurance has been issued.

5.04 CONTRACTOR's Liability Insurance

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and furnished, and will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits and other similar employee benefit acts;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;
3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;
4. claims for damages insured by customary personal injury liability coverage;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefore; and
6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by Paragraph 5.04 A, to be purchased and maintained shall:

1. with respect to insurance required by Paragraphs 5.04 A.3 through 5.04 A.5 inclusive, include as additional insureds (subject to any customary exclusion for professional liability) CITY, DESIGN PROFESSIONAL, Consultants and any other individuals or entities identified in the Supplementary Conditions to be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
2. include at least the specific coverages and be written for not less than the limits of liability provided in Paragraph 5.04 C or required by Laws or Regulations, whichever is greater;
3. include completed operations insurance;
4. include contractual liability insurance covering CONTRACTOR's indemnity obligations;
5. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing defective Work in accordance with Paragraphs 13.06 and 13.07;

6. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two (2) years after final payment (and CONTRACTOR shall furnish CITY and each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued evidence satisfactory to CITY and any such additional insured of continuation of such insurance);

7. contain a cross-liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance;

8. with respect to commercial automobile liability, commercial general liability, and umbrella liability insurance, CONTRACTOR shall require its insurance carrier(s) to waive all rights of subrogation against CITY, and CITY's officers, directors, partners, employees and agents; and

9. contain a provision or endorsement that the costs of providing the insureds a defense and appeal, including attorneys' fees, as insureds, shall be supplementary and shall not be included as part of the policy limits but shall remain the insurer's responsibility.

C. Specific policies of insurance required by this Paragraph 5.04 shall include:

1. Workers' Compensation and Employers' Liability Insurance. This insurance shall protect CONTRACTOR against all claims under applicable state workers' compensation laws, including coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. CONTRACTOR shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of workers' compensation laws. This policy shall include an "all states" or "other states" endorsement. The liability limits shall be not less than:

Workers' Compensation: Statutory

Employers' liability: \$1,000,000 each occurrence

2. Commercial Automobile Liability Insurance. This insurance shall be occurrence type written in comprehensive form and shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the Project Site, whether they are owned, non-owned, or hired.

The liability limits shall be not less than: \$2,000,000

3. Commercial General Liability Insurance. This insurance shall be occurrence type written in comprehensive form acceptable to CITY. This insurance shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include coverage for personal injury liability; contractual liability; completed operations and products liability; and for blasting, explosion, and collapse of buildings; and damage to underground property. The liability limits for bodily injury and property damage shall be not less than:

\$2,000,000 combined single limit for each occurrence

\$2,000,000 general aggregate.

4. The insurer's costs of providing the insureds a defense and appeal as additional insureds, including attorney's fees, shall be supplementary and shall not be included as part of the policy limits but shall remain the insurer's separate responsibility.

5.05 CITY's Liability Insurance

A. In addition to the insurance required to be provided by CONTRACTOR under Paragraph 5.04, CITY, at CITY's option, may purchase and maintain at CITY's expense liability insurance

that will protect CITY against claims which may arise from operations under the Contract Documents.

5.06 Property Insurance

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance on the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws or Regulations). This insurance shall:

1. include the interests of CITY, CONTRACTOR, Subcontractors, and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, tornado, collapse, debris removal, demolition occasioned by enforcement of Laws or Regulations, water damage, damage caused by frost and freezing, and acts of God;
3. be maintained in effect until final payment is made unless otherwise agreed to in writing by CITY with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. CITY shall not be responsible for purchasing and maintaining any property insurance to protect the interests of CONTRACTOR, Subcontractors or others involved in the Work to the extent of any deductible amounts. The risk of loss within the deductible amounts will be borne by CONTRACTOR, Subcontractor or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 Waiver of Rights

A. CITY and CONTRACTOR intend that all policies purchased in accordance with Paragraphs 5.04 and 5.06 will protect CITY, CONTRACTOR, DESIGN PROFESSIONAL Consultants, Subcontractors, and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. CITY and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work, but only to the extent of insurance coverage; and, in addition, waive all such rights against DESIGN PROFESSIONAL, Consultants, Subcontractors, and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of any and each of them) under such policies for losses and damages so caused and covered by insurance. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by CITY as trustee or otherwise payable under any policy so issued. None of the above waivers shall apply if specifically in conflict with Laws and Regulations.

5.08 Receipt and Application of Insurance Proceeds

A. Any insured loss under the property insurance will be adjusted with CITY and made payable to CITY as fiduciary for the insureds, as their interests may appear, subject to the requirements of any indentures of indebtedness entered into by CITY.

B. CITY as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object to CITY's exercise of this power in writing within fifteen (15) days after the occurrence of loss. If such objection is made, CITY as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, CITY as fiduciary shall adjust and settle the loss with the insurers.

5.09 Partial Utilization – Property Insurance

A. If CITY finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with Paragraph 14.05; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.01 Indemnification

A. For purposes of this Paragraph 6.01 only, the following terms shall have the meanings listed:

1. Claims means all claims, damages, liability, losses, costs and expenses, including court costs and reasonable attorneys' fees, including attorney's fees incurred by the City in the enforcement of this indemnity obligation.

2. CONTRACTOR'S Agents means CONTRACTOR's officers, employees, sub-consultants, subcontractors, successors, assigns, invitees, and other agents.

3. CITY means CITY, its Program Manager/Construction Advisor and any of their agents, officials, officers, employees and program managers or construction advisors.

B. CONTRACTOR's obligations under this Paragraph with respect to indemnification for acts or omissions, including negligence, of CITY, shall be limited to the coverage and limits of insurance that CONTRACTOR is required to procure and maintain under this Contract. CONTRACTOR affirms that it has had the opportunity to recover the costs of the liability insurance required in this Contract in its contract price.

C. CONTRACTOR shall defend, indemnify and hold harmless CITY from and against all Claims arising out of or resulting from all acts or omissions in connection with this Contract caused in whole or in part by CONTRACTOR or CONTRACTOR's Agents, regardless of whether or not caused in part by any act or omission, including negligence, of OWNER.

D. In any and all Claims against CITY, DESIGN PROFESSIONAL, CONSULTANT, or any of their respective agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.01 C shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

E. The indemnification obligations of CONTRACTOR under Paragraph 6.01 C shall not extend to liability arising out of, resulting from, or caused by the professional negligence, errors or omissions of DESIGN PROFESSIONAL, CONSULTANT, or any of their respective agents, officers, directors or employees.

6.02 Supervision and Superintendence

A. CONTRACTOR shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent of the Work, who shall not be replaced without written request to and approval by CITY except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

C. If it is determined to be in the best interest of the Work, CONTRACTOR shall replace the project manager, resident superintendent or any other employee of the CONTRACTOR, Subcontractors, Suppliers or other persons or organizations performing or furnishing any of the Work on the project upon written request by the CITY.

6.03 Services, Working Hours, Labor, Materials and Equipment

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out and construct or perform the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the Site shall be performed during regular working hours. CONTRACTOR shall not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without CITY's written consent given after prior written notice to DESIGN PROFESSIONAL.

B. Unless otherwise specified in Division 1, General Requirements, CONTRACTOR shall furnish and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

C. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of CITY. If required by DESIGN PROFESSIONAL, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

D. It is the policy of the CITY that any manufactured goods or commodities used or supplied in the performance of this Contract and any subcontract hereto shall be manufactured or produced in the United States whenever possible.

6.04 Progress Schedule

A. CONTRACTOR shall adhere to the progress schedule established in accordance with Article 2 as it may be adjusted from time to time as provided below:

1. CONTRACTOR shall provide, at least once every thirty (30) calendar days, updated information on the project schedule, including thirty (30) day look ahead schedules, projected variances per event category and per Subcontractor, identification of all variances and calculation of the number of Days difference between the as-built critical path and the project schedule critical path

2. CONTRACTOR shall, with each application for payment, provide completed monthly updated status report for the previous month on the project schedule and updated information indicating as-built and as-planned conditions. The updated information on the project schedule shall not modify any Milestone dates in the project schedule that CITY has previously approved. The updated information required is a condition precedent to payment pursuant to paragraph 14.02 and shall include at a minimum:

- a. a concise statement of the outlook for meeting project schedule dates and the reasons for any change in outlook from the previous report;
- b. a review of any significant technical problems encountered during the month;
- c. an explanation of any corrective action taken or proposed; and
- d. a summary of any Claims anticipated by CONTRACTOR with respect to the Work, including the anticipated costs and schedule impacts of any such Claims.

6.05 Recovery Schedules

A. If the CONTRACTOR should:

1. fail, refuse or neglect to supply a sufficient number of workers or to deliver the materials or equipment with such promptness as to prevent the delay in the progress of the Work;

2. fail in any respect to commence and diligently prosecute the Work in accordance with the approved baseline project schedule in order to achieve substantial completion;

3. fail to commence, prosecute, finish, deliver or install the different portions of the Work on time as specified in the approved baseline project schedule; or

4. fail in the performance of any of the material covenants of the Contract Documents;

CITY shall have the right to direct the CONTRACTOR, upon seven (7) calendar days notice, to prepare a written recovery plan, for CITY's approval, to accelerate the Work in order to conform to the approved baseline project schedule, including, without limitation, providing additional labor or expediting delivery of materials, performing overtime or re-sequencing the Work without adjustments to the Contract value. Upon CITY's approval of the recovery plan, CONTRACTOR shall accelerate the Work in accordance with the plan.

B. Proposed recovery schedules shall be submitted to the CITY as a separate project plan for review and approval by CITY prior to incorporation into the approved baseline schedule. The recovery schedule shall be submitted in a format compatible with the baseline schedule format. Each proposed revision shall be submitted as a separate schedule, with the following minimum requirements:

1. A critical path method diagram showing revised and affected activities or Milestones.
2. An activity report for all revised and affected activities or Milestones.

C. Upon acceptance of the recovery schedule by CITY, data shall be added or revised for all new or revised activities and incorporated into the approved baseline project schedule.

6.06 Substitutes and “Or-Equal” Items

A. Materials or equipment: Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance and quality required. Unless the specification or description contains, or is followed by, words reading that no like, equivalent or “or-equal” item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to CITY for review by CITY’s Representative under the following circumstances:

1. “Or-Equal”: If, prior to receipt of Bids, Bidder proposes an item of material or equipment as functionally equal to that named and sufficiently similar so that no change in related Work will be required, CITY’s Representative may request DESIGN PROFESSIONAL to consider it as an “or-equal” item. DESIGN PROFESSIONAL will review and recommend the acceptance, or rejection, of the proposed item to the CITY’s Representative. For the purposes of this Paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment DESIGN PROFESSIONAL determines that:

(1) it is at least equal in quality, durability, appearance, strength, and design characteristics; and

(2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; and

b. Bidder certifies that:

(1) there is no increase in cost to the CITY; and

(2) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

If the CITY’s Representative approves the proposed item, it may be accepted by CITY.

2. Substitute Items: If CONTRACTOR proposes an item of material or equipment as a substitute item, then CONTRACTOR shall submit sufficient information as provided below to allow CITY’s Representative to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the CITY’s Representative will include the following as supplemented in the General Requirements and as CITY’s Representative may determine is appropriate under the circumstances:

a. Requests for review of proposed substitute items of material or equipment will not be accepted by CITY’s Representative from anyone other than CONTRACTOR.

b. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall first make written application to CITY’s Representative for acceptance thereof.

c. In the application, CONTRACTOR shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will impact CONTRACTOR’s achievement of Substantial Completion, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with CITY for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

d. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by CITY's Representative in evaluating the proposed substitute. CITY's Representative may require CONTRACTOR to furnish additional data about the proposed substitute.

If the CITY's Representative approves the proposed item, CITY may accept it.

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to DESIGN PROFESSIONAL. CONTRACTOR shall notify CITY and submit sufficient information to allow DESIGN PROFESSIONAL, in DESIGN PROFESSIONAL's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents.

C. Expenses: Bidder shall provide all data in support of any "or equal" at Bidder's expense, and CONTRACTOR shall provide all data in support of any proposed substitute at CONTRACTOR's expense.

D. Evaluation: DESIGN PROFESSIONAL and CITY's Representative will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.06 A, and 6.06 B. CITY will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without CITY's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. CITY may require CONTRACTOR to furnish at CONTRACTOR's expense, a special performance guarantee or other surety with respect to any "or-equal" substitute. DESIGN PROFESSIONAL will record time required by DESIGN PROFESSIONAL and Consultants in evaluating substitutes proposed or submitted by CONTRACTOR pursuant to Paragraphs 6.06 A and 6.06 B and in making changes in the Contract Documents (or in the provisions of any other direct contract with CITY for work on the Project) occasioned thereby. Whether or not CITY accepts a substitute so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse CITY for the reasonable charges of DESIGN PROFESSIONAL and Consultants for evaluating each such proposed substitute.

6.07 Concerning Subcontractors, Suppliers and Others

A. CONTRACTOR shall not employ or retain any Subcontractor, Supplier or other person or organization (including those acceptable to CITY as indicated in Paragraph 6.07 B), whether initially or as a substitute, against whom CITY has a reasonable objection, including but not limited to debarment by City or another governmental entity or decertification of the Subcontractor from the City's Minority and Women's Business Enterprise Program as a result of the Subcontractor's failure to comply with any of the requirements of the provisions of Chapter 3 of the City's Code as determined by the Director of the Human Relations Department. Contractor shall insert this provision in any subcontractor agreement associated with this Contract. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection. CONTRACTOR shall submit required information for all Subcontractors on Form 01290.09 - Subcontractor and Major Material Suppliers List, provided in these Contract Documents, prior to Subcontractor beginning Work at the Site.

B. The Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) to be submitted to CITY on or before the date specified in the Supplementary Conditions, for acceptance by CITY. If CONTRACTOR has submitted a list

thereof in accordance with the Supplementary Conditions, CITY may accept (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Contract Documents) any such Subcontractor, Supplier or other person or organization so identified, or may reject same on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier or other person or organization. The Contract Price will be adjusted by the difference in the cost occasioned by such substitution, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by CITY of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of CITY or DESIGN PROFESSIONAL to reject defective Work.

C. CONTRACTOR shall be fully responsible to CITY for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between CITY or DESIGN PROFESSIONAL and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of CITY or DESIGN PROFESSIONAL to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws or Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall contractually require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with CITY and DESIGN PROFESSIONAL through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier shall be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor or Supplier that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of CITY. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against CITY, CONTRACTOR, DESIGN PROFESSIONAL, Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any perils, to the extent covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

H. Except as otherwise provided in this subsection H and in accordance with the provisions of subsection C hereof, the agreement between CONTRACTOR and the Subcontractor or Supplier referred to in subsection G, shall provide that the CONTRACTOR and the Subcontractor or Supplier agree not to request CITY or CITY's Representative to intervene in or facilitate the resolution of claims or contract disputes arising out of or related to the agreement between CONTRACTOR and the Subcontractor or Supplier. Furthermore, the Contracts between CONTRACTOR and Subcontractors or Suppliers shall provide that all unresolved claims and disputes between CONTRACTOR and the Subcontractor or Supplier that remain unresolved after thirty (30) calendar days from the notice of claim, shall be subject to mediation as a condition precedent to the institution of legal proceedings by either party. Any such mediation shall be conducted in accordance with the CITY's Code Section 3-467.

I. CONTRACTOR shall not insert any provision in any subcontractor agreement associated with this Contract that explicitly states or implies that the subcontractor shall only be paid for work performed if or when the general CONTRACTOR is paid by the CITY . Contractor's compliance with this provision is a material term of this Contract.

J. CONTRACTORS shall not deny any Subcontractor subcontracting opportunities solely because the Subcontractor is not a signatory to collective bargaining agreements with organized labor.

6.08 Patent Fees and Royalties

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation into the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work, and if to the actual knowledge of CITY or DESIGN PROFESSIONAL its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by CITY in the Contract Documents. To the fullest extent permitted by Laws or Regulations, CONTRACTOR shall defend, indemnify and hold harmless CITY, DESIGN PROFESSIONAL, Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation into the Work of any invention, design, process, product or device not specified in the Contract Documents.

6.09 Permits

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. CITY shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Contract. CONTRACTOR shall pay all charges of utility owners for connections to the Work.

B. CONTRACTOR, at its own expense, shall comply with all Federal, State and local laws and regulations, including, but not limited to the Missouri Clean Water Law (Chapter 644 RSMo) together with any accompanying regulation(s) contained in the Missouri Code of State Regulations (CSR Title 10), as well as any implementing permits, together with any CITY Provisions during the life of this Contract including but not limited to:

1. Approvals and permits as required for construction or land disturbance activities.
2. Compliance with the State of Missouri – Department of Natural Resources (“MDNR”) Missouri State Operating Permit (“Land Disturbance Permit”), MO-R100006 for all construction or land disturbance activity.
3. Development and implementation of a Storm Water Pollution Prevention Plan (SWPPP).
 - (a) Contractor shall not commence land disturbance activity until the initial SWPPP has been finalized.
 - (b) Preparation and submittal of all applications, documentation and exhibits required to obtain MDNR approvals for uninterrupted Work at the Site.
 - (c) Amending/Updating SWPPP.
 - (d) Site Inspections and submittal of Inspection Reports

(e) Proper Operation and Maintenance to achieve compliance with the terms of the Permit.

(f) Maintenance of required records in accordance with MDNR requirements and requirements included in Article 6 of these Contract Documents.

4. In addition to requirements of Article 6, Contractor shall also provide record access to Missouri Department of Natural Resources (MDNR).

5. Failure to control erosion and water pollution is a permit violation. CONTRACTOR shall have 24 hours after receiving notice of the violation to correct the problem. If the CONTRACTOR fails to correct the problem after the time prescribed, the City will hire a remediation expert to fix the problem. In such an event, the CONTRACTOR shall be liable to the City for the remediation costs plus a 10% mark-up of the total contract price. If the CONTRACTOR receives three (3) notices of violation of the erosion control plan and the City's MS4 permit, the Director may issue a stop work order and delay any payment until control measures are properly functioning and stream damage has been mitigated. In such an event, any delay to the project schedule will result in liquidated damages assessed against the CONTRACTOR.

6.10 Compliance with Laws and Regulations

A. CONTRACTOR shall give all notices and comply with all Laws or Regulations applicable to furnishing and performing the Work. Except where otherwise expressly required by applicable Laws or Regulations, neither CITY nor DESIGN PROFESSIONAL shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations. The Laws or Regulations included in this Paragraph shall include, but not be limited to, those set forth in the Supplementary Conditions.

B. Failure to Comply. If CONTRACTOR performs any Work in violation of applicable Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting therefrom; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws or Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under Paragraph 3.03.

C. Conflicts of Interest. The provisions of City's Code Sections 2-1015 and 3-301, prohibiting City officers and employees from having a financial or personal interest in any contract with City, and Code Sections 3-307, and 3-309, imposing sanctions for violations, shall apply to this Contract. CONTRACTOR certifies that no officer or employee of City has, or will have, a direct or indirect financial or personal interest in this Contract, and that no officer or employee of City, or member of such officer's or employee's immediate family, either has negotiated, or has or will have an arrangement concerning employment to perform services on behalf of CONTRACTOR on this Contract.

D. Licenses and Permits. CONTRACTOR, at its own expense, shall secure or cause to be secured all licenses and permits from public or private sources necessary for the fulfillment of its obligations under this Contract. All references in this Contract to the "Code" shall mean City's Code of Ordinances, including any amendments thereto or re-codification thereof unless the context clearly indicates otherwise. CONTRACTOR shall obtain copies of all necessary licenses and permits from Subcontractors required for the Work before Subcontractors begin Work at the Site. CONTRACTOR shall retain such evidence in its files and make available to CITY within ten (10) days after CITY's written request.

E. Americans with Disabilities Act. CONTRACTOR agrees to comply, during the course of this Contract, with all provisions of Title II of the 2010 ADA Standards for Accessible Design as amended from time to time.

F. Affirmative Action. If the Contract Price exceeds \$300,000.00 and CONTRACTOR employs fifty (50) or more people, CONTRACTOR shall comply with City's Affirmative Action requirements in accordance with the provisions of Chapter 3 of City's Code, the rules and regulations relating to those sections, and any additions or amendments thereto. CONTRACTOR shall not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 3 of City's Code.

CONTRACTOR shall:

1. Submit, in print or electronic format, a copy of CONTRACTOR'S current certificate of compliance to the City's Human Relations Department (HRD) prior to receiving the first payment under the contract, unless a copy has already been submitted to HRD at any point within the previous two calendar years. If, and only if, CONTRACTOR does not possess a current certification of compliance, CONTRACTOR shall submit, in print or electronic format, a copy of its affirmative action program to HRD prior to receiving the first payment under the contract, unless a copy has already been submitted to HRD at any point within the previous two calendar years.

2. Require any Subcontractor awarded a subcontract exceeding \$300,000.00 to affirm that Subcontractor has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the subcontract.

3. Obtain from any Subcontractor awarded a subcontract exceeding \$300,000.00 a copy of the Subcontractor's current certificate of compliance and tender a copy of the same, in print or electronic format, to HRD within thirty (30) days from the date the subcontract is executed. If, and only if, Subcontractor does not possess a current certificate of compliance, CONTRACTOR shall obtain a copy of the Subcontractor's affirmative action program and tender a copy of the same, in print or electronic format, to HRD within thirty (30) days from the date the subcontract is executed.

City has the right to take action as directed by City's Human Relations Department to enforce this provision. If CONTRACTOR fails, refuses or neglects to comply with the provisions of Chapter 3 of City's Code, then such failure shall be deemed a total breach of this Contract and this Contract may be terminated, canceled or suspended, in whole or in part, and CONTRACTOR may be declared ineligible for any further contracts funded by City for a period of one (1) year. This is a material term of this Contract.

G. Minority and Women Business Enterprises and Workforce. City is committed to ensuring that minorities and women participate to the maximum extent possible in the performance of City's construction contracts. If minority and women business enterprise (M/WBE) goals have been set for this Contract, CONTRACTOR agrees to comply with all requirements of City's Minority and Women's Business Enterprise Program as enacted in City's Code, Sections 3-421 through 3-469 and as hereinafter amended. CONTRACTOR shall meet or exceed both the MBE and WBE goals set forth in its Contractor Utilization Plan/Request for Waiver. If workforce utilization goals are applicable to this Contract, CONTRACTOR agrees to comply with all requirements of City's Construction Employment Program as enacted in City's Code, Sections 3-501 through 3-525 and as hereinafter amended. CONTRACTOR shall meet or exceed the construction employment goals unless the same shall have been waived in the manner provided by law. CONTRACTOR's compliance with this provision is a material part of this Contract.

H. Records.

1. For purposes of this section:

(a) "City" shall mean the City Auditor, the City's Internal Auditor, the City's Director of Human Relations, the City Manager, the City department administering this Contract and their delegates and agents.

(b) "Record" shall mean any document, book, paper, photograph, map, sound recordings or other material, regardless of physical form or characteristics, made or received in connection with this Contract and all Contract amendments and renewals.

2. Contractor shall maintain and retain all Records for a term of five (5) years that shall begin after the expiration or termination of this Contract and all Contract amendments. City shall have a right to examine or audit all Records and Contractor shall provide access to City of all records upon ten (10) days written notice from the City.

I. Prevailing Wage.

1. CONTRACTOR shall comply and require its Subcontractors to comply with;

a. sections 290.210 to 290.340, RSMO the State of Missouri Prevailing Wage Law (the "Law"); and

b. 8 CSR 30-3.010 to 8 CSR 30-3.060, the Prevailing Wage Law Rules (the "Rules"); and

c. the Annual Wage Order (Wage Order) issued by the State of Missouri's Department of Labor and Industrial Relations; and

d. any applicable Annual Incremental Wage Increase (Wage Increase) to the Annual Wage Order.

2. The Law, Rules, Annual Wage Order and any Wage Increase are incorporated into and made part hereof this Contract and shall be collectively referred to in this Section as the "Prevailing Wage Requirements."

3. CONTRACTOR shall pay and require its Subcontractors to pay to all workers performing work under this Contract not less than the prevailing hourly rate of wages for the class or type of work performed by the worker in accordance with the Law, Rules, Wage Order and any applicable Wage Increase. CONTRACTOR shall take whatever steps are necessary to insure that the prevailing hourly wage rates are paid and that all workers for CONTRACTOR and each of its Subcontractors are paid for the class or type of work performed by the worker in accordance with the Prevailing Wage Requirements. If CONTRACTOR shall fail to start to perform CONTRACTOR's obligations under the Contract Documents within sixty (60) days from the Effective Date of the Contract, CONTRACTOR and each of its subcontractors shall be obligated to pay all workers in accordance with any new Wage Order, as subsequently amended by any applicable Wage Increase, issued by the Department of Labor and Industrial Relations within the aforementioned sixty (60) day period. The new Wage Order and any applicable Wage Increase shall govern notwithstanding the fact that the Wage Order being replaced might be physically attached or incorporated in the Contract Documents.

4. Prior to each of its Subcontractors beginning Work on the Site, CONTRACTOR shall require each Subcontractor to complete CITY's Form 00490 entitled "Pre-contract Certification" that sets forth the Subcontractor's prevailing wage and tax compliance history for the two (2) years prior to the bid. CONTRACTOR shall retain one (1) year and make the Pre-contract Certifications available to CITY within five (5) days after written request.

5. CONTRACTOR shall:

a. Keep and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to keep full and accurate records on City's "Daily Labor Force Report" Form indicating the worker's name, occupational title or classification group & skill and the workers' hours. City shall furnish blank copies of the Daily Labor Force Report Form to Contractor for its use and for distribution to Subcontractors. Contractor shall submit its and its Subcontractors Daily Labor Force Reports to City each day; and

b. Submit, and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to submit electronically, in a format prescribed by the City, Certified Payroll Report Information indicating the worker's name, address, social security number, occupation(s), craft(s) of every worker employed in connection with the public work together with the number of hours worked by each worker and the actual wages paid in connection with the Project and other pertinent information as requested by the City; and

c. Submit, and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to submit, electronically, in format prescribed by the City, a Payroll Certification. The Payroll Certification must be signed by the employee or agent who pays or supervises the payment of the workers employed under the Contract for the Contractor and each Subcontractor; and

d. The Daily Labor Force Report, documents used to compile information for the Certified Payroll Report, and Payroll Certification are collectively referred to in this Section as the "Records."

6. CONTRACTOR shall submit its and its Subcontractors Daily Labor Force Reports to CITY each day. CONTRACTOR shall make all of CONTRACTOR's and Subcontractors' Records open to inspection by any authorized representatives of OWNER and the Missouri Department of Labor and Industrial Relations at any reasonable time and as often as they may be necessary and such Records shall not be destroyed or removed from the State of Missouri for a period of one (1) year following the completion of the public work in connection with which the Records are made. CONTRACTOR shall have its and its Subcontractors Certified Payroll Reports and Payroll Certifications available at the CONTRACTOR's office and shall provide the Records to the City electronically at City's sole discretion. In addition, all Records shall be considered a public record and CONTRACTOR shall provide the Records to the CITY in the format required by the CITY within three (3) working days of any request by CITY at the CONTRACTOR's cost. CITY, in its sole discretion, may require CONTRACTOR to send any of the Records directly to the person who requested the Record at CONTRACTOR's expense.

7. CONTRACTOR shall post and keep posted a clearly legible statement of all prevailing hourly wage rates to be paid to all workers employed by CONTRACTOR and each of its Subcontractors in the performance of this Contract in a prominent and easily accessible place at the Site of the Work by all workers.

8. If the Contract Price exceeds \$250,000.00, CONTRACTOR shall and shall require each Subcontractor engaged in any construction of public works to have its name, acceptable abbreviation or recognizable logo and the name of the city and state of the mailing address of the principal office of the company, on each motor vehicle and motorized self-propelled piece of equipment which is used in connection with the Project during the time the CONTRACTOR or Subcontractor is engaged on the project. The sign shall be legible from a distance of twenty (20') feet, but the size of the lettering need not be larger than two (2") inches. In cases where equipment is leased or where affixing a legible sign to the equipment is impractical, the CONTRACTOR may place a temporary stationary sign, with the information required pursuant to this section, at the main entrance of the Project in place of affixing the required information on the equipment so long as such sign is not in violation of any state or federal statute, rule or regulation. Motor vehicles which are required to have similar information affixed thereto pursuant to requirements of a regulatory agency of the state or federal government are exempt from the provisions of this subsection.

9. CONTRACTOR must correct any errors in CONTRACTOR's or any Subcontractors' Records, or CONTRACTOR's or any Subcontractors' violations of the Law, Rules, Annual Wage Order and any Wage Increase within fourteen (14) calendar days after notice from CITY.

10. CONTRACTOR shall and shall require its Subcontractors to cooperate with the CITY and the Department of Labor and Industrial Relations in the enforcement of this Section, the Law, Rules, Annual Wage Order and any Wage Increase. Contractor shall and shall require its Subcontractors to permit CITY and the Department of Labor and Industrial Relations to interview any and all workers during working hours on the Project at CONTRACTOR's sole cost and expense.

11. CONTRACTOR shall file with CITY, upon completion of the Project and prior to final payment therefore, affidavits from CONTRACTOR and each of its Subcontractors, stating that each has fully complied with the provisions and requirements of the Missouri Prevailing Wage Law. CITY shall not make final payment until the affidavits, in proper form and order, from CONTRACTOR and each of its Subcontractors, are filed by CONTRACTOR.

12. CONTRACTOR shall forfeit as a statutory penalty to the CITY one hundred dollars (\$100.00) for each worker employed, for each calendar day, or portion thereof, such worker is paid less than the prevailing hourly rates for any work done under this Contract, by CONTRACTOR or by any of CONTRACTOR's Subcontractors. If CONTRACTOR or any of its Subcontractors have violated any section(s) of 290.210 to 290.340, RSMo, in the course of the execution of the Contract, CITY shall when making payments to the CONTRACTOR becoming due under this Contract, withhold and retain therefrom all sums and amounts due and owing as a result of any violation of sections 290.210 to 290.340, RSMo.

J. Prevailing Wage Damages. CONTRACTOR acknowledges and agrees that, based on the experience of CITY, violations of the Missouri Prevailing Wage Act, whether by CONTRACTOR or its Subcontractors, commonly result in additional costs to CITY. CONTRACTOR agrees that additional costs to CITY for any particular violation are difficult to establish and include but are not limited to: costs of construction delays, additional work for CITY, additional interest expenses, investigations, and the cost of establishing and maintaining a special division working under the City Manager to monitor prevailing wage compliance.

1. In the event of the failure by CONTRACTOR or any of its Subcontractors to pay wages as provided in the Missouri Prevailing Wage Act, CITY shall be entitled to deduct from the Contract Price, and shall retain as liquidated damages, one hundred dollars (\$100.00) per day, per worker who is paid less than the prevailing hourly rate of wages, to approximate the additional costs. The sum shall be deducted, paid or owed whether or not the Contract Times have expired.

2. CITY shall give written notice to CONTRACTOR setting forth the workers, who have been underpaid, the amount of the statutory penalty and the amount of the liquidated damages as provided for in this Subparagraph J. CONTRACTOR shall have fourteen (14) calendar days to respond, which time may be extended by CITY upon written request. If CONTRACTOR fails to respond within the specified time, the CITY's original notice shall be deemed final. If CONTRACTOR responds to CITY's notice, CITY will furnish CONTRACTOR a final decision in writing within five (5) days of completing any investigation.

K. Missouri Secretary of State Business Entity Registration. CONTRACTOR shall obtain from all Subcontractors for the Project, a copy of their current certificate of good standing or fictitious name registration from the Missouri Secretary of State before they begin work on the Site. CONTRACTOR shall retain such documents in its files and make available to CITY within ten (10) days after written request.

L. Tropical Hardwoods. The provisions of Code Section 2-1872, restricting the use of tropical hardwoods, shall apply to this Contract.

M. Preference for Missouri Products. Pursuant to Section 71.140 RSMo., preference shall be given to materials, products, supplies and all other articles produced, manufactured, made or grown within the State of Missouri.

N. Guidelines for Open Excavations.

1. CONTRACTOR shall restore required excavations to the level of the adjacent surfaces as soon as practicable. Unsupervised open excavations on public properties are discouraged at all times. If CONTRACTOR, in performance of the Work, makes or causes to be made any excavation in, upon, under, through or adjoining any street, sidewalk, alley, park, boulevard, parkway or any other public properties, and shall leave any part or portion thereof open, CONTRACTOR shall provide effective protection to the public.

2. CONTRACTOR shall protect and secure all excavations in roadways in compliance with existing federal, state and local codes and standards, including, but not limited to the most current edition of the Manual of Uniform Traffic Control Devices. CONTRACTOR shall protect and secure all unsupervised excavations not within roadways, either by covering or fencing.

a. Covering. A protective cover that can sustain the weight of persons or of objects that are placed upon it may be installed over an unsupervised excavation. The cover shall be secured to the ground to prevent movement. Protective covers shall have no opening(s) or protuberance(s) of sufficient size to cause a fall and/or injury. Advance warning devices shall be installed as necessary.

b. Fencing. Fencing to prevent entry may be installed surrounding an unsupervised excavation not protectively covered in its entirety. The fencing shall be a minimum of 42" in height. The fencing shall be constructed in such a manner that it is adequately secured and will remain upright at all times under normal Site conditions. All protective coverings and fences over and around excavations shall be inspected at least daily to assure integrity. Protective coverings and/or fences in heavily trafficked areas shall be inspected more often as necessary.

O. Notification of Utilities. CONTRACTOR shall adhere to the provisions of Sections 319.010 et seq., RSMo., which requires that a person or firm making an excavation in any public street, road or alley, right of way dedicated to public use, utility easement of record, or within any private street or private property do so only after giving notice to, and obtaining information from, owners of Underground Facilities. The 24-hour, toll-free accident prevention hotline number in Missouri is 1-800-344-7483 (1-800-Digrite).

P. Employee Eligibility Verification. CONTRACTOR shall adhere to the provisions of Sections 285.525 et seq., RSMo., which requires that for any contract exceeding five thousand dollars (\$5,000.00), CONTRACTOR shall execute and submit an affidavit, in a form prescribed by CITY, affirming that CONTRACTOR does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. § 1324a(h)(3). CONTRACTOR shall attach to the affidavit documentation sufficient to establish CONTRACTOR'S enrollment and participation in an electronic verification of work program operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and Control Act of 1986. CONTRACTOR may obtain additional information about E-Verify and enroll at <https://e-verify.uscis.gov/enroll/StartPage.aspx?JS=YES>. For those Contractors enrolled in E-Verify, the first and last pages of the E-Verify Memorandum of Understanding that CONTRACTOR will obtain upon successfully enrolling in the program shall constitute sufficient documentation for purposes of complying with this Section. CONTRACTOR shall submit the affidavit and attachments to CITY prior to execution of the Contract, or at any point during the term of the Contract if requested by City.

Q. OSHA 10-Hour Training Requirement. CONTRACTOR and any subcontractor working under this Contract shall require every employee on the Site to complete a ten-hour construction safety program which meets the requirements of Section 292.675, RSMo, except for those employees who shall have previously completed the required program and hold documentation to that effect. CONTRACTOR shall remove or require the removal of any

person from the Site who is subject to this requirement and who does not complete or is unable to produce documentation of their successful completion of the required program within the time limitations prescribed by Section 292.675, RSMo. CONTRACTOR shall forfeit the sum of two thousand five hundred dollars (\$2,500.00), in addition to one hundred dollars (\$100.00) per employee each calendar day, or portion thereof, the employee(s) shall continue to be employed without having completed the required program within the time limitations prescribed by Section 292.675, RSMo. CITY shall be entitled to withhold and retain any amounts due and owing hereunder when making payment to CONTRACTOR.

R. Clean Air Act and Clean Water Act. CONTRACTOR shall comply with requirements of the Clean Air Act (42 U.S.C. 7401 *et seq.*); Clean Water Act (33 U.S.C. 1251 *et seq.*), Missouri Clean Water Law (Chapter 644 RSMo), Code of Federal regulations (Title 40: Protection of Environment, Title 33: Navigation and Navigable Waters) and the rules of the Missouri Code of State Regulations (CSR Title 10).

S. Contract information Management System. If applicable, CONTRACTOR shall comply with CITY's Contract Information Management System requirements. CONTRACTOR shall use CITY's Internet web based Contract Information Management System/Project Management Communications Tool provided by CITY and protocols included in that software during the term of this Contract. CONTRACTOR shall maintain user applications to CITY's provided system for all personnel, subcontractors or suppliers as applicable and shall require subcontractors/subconsultants to maintain same.

6.11 Taxes

A. CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws or Regulations of the place of the Project which are applicable during the performance of the Work.

B. Tax Compliance.

1. As a condition precedent to CITY making its first payment to CONTRACTOR under this Contract, CONTRACTOR shall furnish to CITY sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year prior to the date provided to CITY, verifying that CONTRACTOR is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department.

2. As a condition precedent to Subcontractors performing any Work under this Contract, CONTRACTOR shall obtain from Subcontractor sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the date Subcontractor begins Work, verifying that the Subcontractor is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department. CONTRACTOR shall retain such documentation in its files and make available to CITY within ten (10) days after a written request.

3. As a condition precedent to CITY making final payment under this Contract, if this Contract is longer than one (1) year and exceeds the dollar threshold established by ordinance and included in the Supplementary Conditions, CONTRACTOR shall furnish to CITY sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the filing of a final Application for Payment, verifying that CONTRACTOR is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department.

4. If this Contract is longer than one (1) year and exceeds the dollar threshold established by ordinance and included in the Supplementary Conditions, CONTRACTOR shall obtain from Subcontractors sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the date of CONTRACTOR's final payment to the Subcontractor, that the Subcontractor was or is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department.

CONTRACTOR shall retain such documentation in its files and make available to CITY within ten (10) days after written request.

5. If, at the time of final payment to CONTRACTOR, CONTRACTOR is unable to obtain from all its Subcontractors, if any, and furnish to CITY sufficient proof from City's Commissioner of Revenue that all its Subcontractors are in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department, CITY may approve final payment to CONTRACTOR if CITY determines that CONTRACTOR has made a good faith effort to furnish evidence or that there are other extenuating circumstances which make it impossible for CONTRACTOR to furnish sufficient proof.

C. Missouri Sales Tax Exemption. Pursuant to Section 144.062, RSMo, CITY is a Missouri exempt entity and tangible personal property to be incorporated or consumed in the construction of this Project may be purchased without sales tax. CITY shall furnish CONTRACTOR a Missouri Project Exemption Certificate for Sales Tax at the time of issuance of the Notice to Proceed.

6.12 Use of Site and Other Areas

A. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas identified in and permitted by the Contract Documents and other areas permitted by Laws or Regulations. CONTRACTOR shall not unreasonably encumber the Site and the other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to the Site or the other areas, or to the owner or occupant thereof, or of any adjacent land or areas, resulting from the performance of the Work.

B. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. In case of a failure on the part of the CONTRACTOR to restore such property or to make good such damage or injuries, the CITY may, upon forty-eight (48) hours written notice to the CONTRACTOR, repair, rebuild or otherwise restore such property as the CITY may deem necessary, and the cost thereof will be deducted from any moneys due or which may become due the CONTRACTOR under this Contract.

C. CONTRACTOR shall, to the fullest extent permitted by Laws or Regulations, defend, indemnify and hold harmless CITY, DESIGN PROFESSIONAL, Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against CITY, DESIGN PROFESSIONAL or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

D. During the progress of the Work, CONTRACTOR shall keep the Site and the other areas free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from Site and other areas as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the Site clean and ready for utilization or occupancy by CITY at Substantial Completion of the Work. CONTRACTOR shall restore to all property not designated for alteration by the Contract Documents to its pre-Work condition.

E. CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.13 Record Documents

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, the Contract, Written Amendments, Change Orders, Work Change Directives, and written interpretations and clarifications in good order and annotated to show all changes made during construction. These record documents, together with all approved Samples and a counterpart of all approved Shop Drawings, will be available to CITY and DESIGN PROFESSIONAL for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered to DESIGN PROFESSIONAL for CITY.

6.14 Safety and Protection

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall comply with all applicable Laws or Regulations relating to the safety of persons or property to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for safety and protection. CONTRACTOR shall deliver to CITY a copy of CONTRACTOR'S Health and Safety Plan as provided in the Notice of Intent to Contract.

B. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in Paragraph 6.14 B.2 or 6.14 B.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of CITY, DESIGN PROFESSIONAL, Consultant, or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR, Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and DESIGN PROFESSIONAL has issued a notice to CONTRACTOR in accordance with Paragraph 14.07 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion). CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of the Work.

6.15 Safety Representative

A. In accordance with OSHA standards, CONTRACTOR shall designate a qualified and experienced safety representative whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs. CONTRACTOR's safety representative shall remain at the Site whenever there is Work in progress and shall immediately notify CITY of any emergencies or accidents occurring at the Site

6.16 Hazard Communication Programs

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.17 Emergencies

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR, without special instruction or authorization from CITY or DESIGN PROFESSIONAL, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give CITY and DESIGN PROFESSIONAL prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If CITY determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to an emergency, a Work Change Directive or Change Order will be issued.

B. A change in the Contract Documents pursuant to Paragraph 6.15 A will not be an automatic authorization of, nor a condition precedent to, entitlement to adjustment in the Contract Price or Contract Times. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price or Contract Times, a Claim may be made therefore as provided in Article 16. However, OWNER, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

6.18 Shop Drawings and Samples

A. CONTRACTOR shall submit Shop Drawings to DESIGN PROFESSIONAL for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see Paragraph 2.07). All submittals shall be identified as DESIGN PROFESSIONAL may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show DESIGN PROFESSIONAL the services, materials and equipment CONTRACTOR proposes to provide and to enable DESIGN PROFESSIONAL to review the information for the limited purposes required by Paragraph 6.18 D.

B. CONTRACTOR shall also submit Samples to DESIGN PROFESSIONAL for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample shall be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as DESIGN PROFESSIONAL may require to enable DESIGN PROFESSIONAL to review the submittal for the limited purposes required by Paragraph 6.18 D. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Submittal Procedures:

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submission, CONTRACTOR shall give DESIGN PROFESSIONAL specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, the notice to be in a written communication separate from the submittal, and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to DESIGN PROFESSIONAL for review and approval of each such variation.

D. DESIGN PROFESSIONAL's Review:

1. DESIGN PROFESSIONAL will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by DESIGN PROFESSIONAL as required by Paragraph 2.06. DESIGN PROFESSIONAL's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation into the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. DESIGN PROFESSIONAL's review and approval will not extend to means, methods, techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. DESIGN PROFESSIONAL's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called DESIGN PROFESSIONAL's attention to each such variation at the time of submission as required by Paragraph 6.18 C.3, and DESIGN PROFESSIONAL has given written approval of each such variation by specific written notation thereof incorporated into or accompanying the Shop Drawing or Sample approval; nor will any approval by DESIGN PROFESSIONAL relieve CONTRACTOR from responsibility for complying with the requirements of Paragraph 6.18 C.1.

E. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by DESIGN PROFESSIONAL as required by Paragraph 2.06, any related Work performed prior to DESIGN PROFESSIONAL's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

F. CONTRACTOR shall make corrections required by DESIGN PROFESSIONAL and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by DESIGN PROFESSIONAL on previous submittals.

6.19 Continuing the Work

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with CITY No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as CITY and CONTRACTOR may otherwise agree in writing.

6.20 CONTRACTOR's General Warranty and Guarantee

A. CONTRACTOR warrants and guarantees to CITY, DESIGN PROFESSIONAL and Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers or any other individual or entity for whom CONTRACTOR is responsible; or
2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by DESIGN PROFESSIONAL;
2. recommendation of any progress or final payment by DESIGN PROFESSIONAL;
3. the issuance of a certificate of Substantial Completion or any payment related thereto by CITY to CONTRACTOR;
4. use or occupancy of the Work or any part thereof by OWNER;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by DESIGN PROFESSIONAL;
6. any inspection, test or approval by others; or
7. any correction of defective Work by CITY.

C. Nonconforming Work is rejected unless expressly accepted in writing by the CITY's Representative.

ARTICLE 7 OTHER WORK

7.01 Related Work at Site

A. CITY may perform other work related to the Project at the Site by CITY's own forces, or let other direct contracts therefore, or have other work performed by utility owners. If such other work is to be performed and such fact was not noted in the Contract Documents, then:

1. Written notice thereof will be given to CONTRACTOR prior to starting any such other work, and
2. CONTRACTOR may make a Claim therefore as provided in Article 16 if CONTRACTOR believes that such performance involves additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the amount or extent thereof.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract, and each utility owner (and CITY, if CITY is performing the additional work with CITY's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of CITY and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of

CONTRACTOR in said direct contracts between CITY and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to CITY and DESIGN PROFESSIONAL in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable for the proper execution or results of CONTRACTOR's Work. CONTRACTOR's failure to report same will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work, except for latent or non-apparent defects and deficiencies in such other work.

7.02 Coordination

A. If CITY contracts with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, CITY shall have sole authority and responsibility in respect of such coordination.

ARTICLE 8 CITY'S RESPONSIBILITIES

8.01 Communications to CONTRACTOR

A. Except as otherwise provided in these General Conditions, CITY shall issue all communications to CONTRACTOR.

8.02 Replacement of DESIGN PROFESSIONAL

A. In case of termination of the employment of DESIGN PROFESSIONAL, CITY shall appoint a DESIGN PROFESSIONAL whose status under the Contract Documents shall be that of the former DESIGN PROFESSIONAL.

8.03 Furnish Data and Prompt Payment

A. CITY shall promptly furnish the data required of OWNER under the Contract Documents and shall make payments to CONTRACTOR when they are due.

8.04 Lands and Easements; Reports and Tests

A. CITY's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to CITY's duty to identify and make available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the Site and drawings of physical conditions in existing structures at or contiguous to the Site that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents.

8.05 Insurance

A. CITY's responsibilities, if any, for purchasing and maintaining liability and property insurance are set forth in Article 5 and the Supplementary Conditions.

8.06 Change Orders

A. CITY is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.07 Inspections, Tests and Approvals

A. CITY's responsibility for certain inspections, tests and approvals is set forth in Paragraph 13.02 F.

8.08 Limitations on CITY's Responsibilities

A. The CITY shall not supervise, direct or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws or Regulations applicable to the furnishing or performance of the Work. CITY will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

8.09 Undisclosed Hazardous Environmental Condition

A. CITY's responsibility for an undisclosed Hazardous Environmental Condition uncovered or revealed at the Site is set forth in Paragraph 4.06.

8.10 Evidence of Financial Arrangements

A. CITY will furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract.

8.11 CITY's Representative

A. CITY will provide a representative during the construction period. The duties, responsibilities and the limitations of authority of the CITY "s Representative during construction are set forth in the Contract Documents.

8.12 Visits to Site

A. CITY's Representative will make visits to the Site at intervals appropriate to the various stages of construction as CITY's Representative deems necessary in order to observe the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, CITY's Representative will endeavor to determine, in general, if the Work is proceeding in accordance with the Contract Documents. CITY's Representative will not be required to make exhaustive or continuous on-Site inspections to check the quality or quantity of the Work.

ARTICLE 9 DESIGN PROFESSIONAL's STATUS DURING CONSTRUCTION

9.01 General Scope of DESIGN PROFESSIONAL's Duties

A. DESIGN PROFESSIONAL's efforts will be directed toward providing for CITY a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of visits to the Site and on-Site observations, DESIGN PROFESSIONAL will keep CITY informed of the progress of the Work and will endeavor to guard CITY against defective Work. DESIGN PROFESSIONAL's visits to the Site and on-Site observations are subject to all the limitations on DESIGN PROFESSIONAL's authority and responsibility set forth in Paragraph 9.08.

9.02 Resident Project Representative

A. If CITY and DESIGN PROFESSIONAL agree, DESIGN PROFESSIONAL will furnish a resident Project representative to assist DESIGN PROFESSIONAL in providing more extensive observation of the Work. The responsibilities, authority and limitations thereon of any such resident Project representative and assistants will be as provided in Paragraph 9.08 and in the Supplementary Conditions.

9.03 Clarifications and Interpretations

A. DESIGN PROFESSIONAL will issue with reasonable promptness written clarifications or interpretations (which may be in the form of Drawings) of the requirements of the Drawings

and Specifications prepared by the DESIGN PROFESSIONAL as DESIGN PROFESSIONAL may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on CITY and CONTRACTOR. If CITY or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract Price pursuant to Article 11 and/ or the Contract Times pursuant to Article 12 and the parties are unable to agree to the amount or extent thereof, if any, a Claim may be made therefore as provided in Article 16.

9.04 Rejecting Defective Work

A. DESIGN PROFESSIONAL will have authority to disapprove or reject Work which DESIGN PROFESSIONAL believes to be defective, that DESIGN PROFESSIONAL believes will not produce a completed Project that conforms to the Contract Documents, or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. DESIGN PROFESSIONAL will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04 B, whether or not the Work is fabricated, installed or completed.

9.05 Shop Drawings, Change Orders and Payments

A. In connection with DESIGN PROFESSIONAL's authority as to Shop Drawings and Samples, see Paragraph 6.18.

B. In connection with DESIGN PROFESSIONAL's authority as to Change Orders, see Article 10.

C. In connection with DESIGN PROFESSIONAL's authority as to Applications for Payment, see Article 14.

9.06 Determinations for Unit Prices

A. DESIGN PROFESSIONAL will initially determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. DESIGN PROFESSIONAL will review with CONTRACTOR the DESIGN PROFESSIONAL's preliminary determinations on such matters before rendering a written opinion thereon (by recommendation of an Application for Payment or otherwise to the CITY). CITY reserves the right to make a final determination of the actual quantities and classifications of Unit Price Work in reviewing an Application for Payment. Within ten (10) days after the date of receipt of any such decision, CONTRACTOR may deliver to CITY and to DESIGN PROFESSIONAL written notice of intention to appeal CITY's decision pursuant to Article 16.

9.07 Decisions on Requirements of Contract Documents and Acceptability of Work

A. DESIGN PROFESSIONAL will be the initial interpreter of the requirements of the Drawings and Specifications prepared by DESIGN PROFESSIONAL and judge of the acceptability of the Work thereunder.

B. When functioning as interpreter and judge under this Paragraph 9.07, DESIGN PROFESSIONAL will not show partiality to OWNER or CONTRACTOR.

C. Claims, disputes and other matters relating to the acceptability of the Work, quantities and classifications of Unit Price Work, or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work will be referred initially to CITY's Representative in writing with a request for a formal decision in accordance with Article 16.

9.08 Limitations on DESIGN PROFESSIONAL's Authority and Responsibilities

A. Neither DESIGN PROFESSIONAL's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by DESIGN PROFESSIONAL in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by DESIGN PROFESSIONAL shall create, impose or give rise to any duty owed by DESIGN

PROFESSIONAL to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them.

B. DESIGN PROFESSIONAL will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws or Regulations applicable to the furnishing or performance of the Work. DESIGN PROFESSIONAL will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

C. DESIGN PROFESSIONAL will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

D. DESIGN PROFESSIONAL's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, Bonds and certificates of inspection, tests and approvals and other documentation required to be delivered by Paragraph 14.07 will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals, that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.08 shall also apply to DESIGN PROFESSIONAL's Consultants, resident Project representative and assistants as identified in the Supplementary Conditions.

ARTICLE 10 CHANGES IN THE WORK

10.01 Authorized Changes in the Work

A. Without invalidating the Contract and without notice to any surety, CITY may, at any time or from time to time, order additions, deletions or revisions in the Work. Such additions, deletions or revisions will be authorized by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved that will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If CITY and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price pursuant to Article 11 or an adjustment of the Contract Times pursuant to Article 12 or both that should be allowed as a result of a Work Change Directive, a Claim may be made therefore as provided in Article 16.

10.02 Unauthorized Changes in the Work

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.17 or in the case of uncovering Work as provided in Paragraph 13.04.

10.03 Signing of Change Orders

A. CITY and CONTRACTOR, and DESIGN PROFESSIONAL shall sign appropriate Change Orders covering:

1. changes in the Work which are:
 - a. ordered by CITY pursuant to Paragraph 10.01 A; or
 - b. required because of acceptance of defective Work under Paragraph 13.08 or correcting defective Work under Paragraph 13.09; or
 - c. agreed to by the parties;

2. changes in the Contract Price or Contract Times or both which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times or both which embody the substance of any written decision recommended by DESIGN PROFESSIONAL and approved by CITY pursuant to Paragraph 9.06, provided that, in lieu of signing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws or Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in Paragraph 6.19.

10.04 Notification to Surety

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times or both) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

ARTICLE 11 CHANGE OF CONTRACT PRICE

11.01 Change of Contract Price

A. The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at CONTRACTOR's expense without change in the Contract Price.

B. The Contract Price may only be changed by a Change Order. Any request for an adjustment in the Contract Price shall be based on written notice delivered within fourteen (14) calendar days after occurrence of the event giving rise to the request or within fourteen (14) calendar days after first recognition of the conditions giving rise to the request. Prior notice is not required for requests or claims relating to an emergency endangering life or property as described in Paragraph 6.16. Thereafter, the CONTRACTOR shall submit written documentation of its request, including appropriate supporting documentation, within ten (10) calendar days after giving notice, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted.

C. The value of any Work covered by a Change Order or of any request for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by Unit Prices contained in the Contract Documents, by application of such Unit Prices to the quantities of the items involved (subject to the provisions of Paragraph 11.04); or

2. where the Work involved is not covered by Unit Prices contained in the Contract Documents, by a mutually agreed lump sum; or

3. where the Work involved is not covered by Unit Prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 11.01 C.2, on the basis of the Cost of the Work (determined as provided in Paragraphs 11.02 A and B) plus a CONTRACTOR's fee for overhead and profit (determined as provided in Paragraph 11.01 D).

D. The CONTRACTOR's fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.02 A.1 and 11.02 A.2, the CONTRACTOR's fee shall be ten percent (10%);

b. for costs incurred under Paragraph 11.02 A.3, the CONTRACTOR's fee shall be five percent (5%);

c. where one or more tiers of subcontracts are on the basis of the Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01 D.2 and 11.02 A.1 through A.3 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be paid a fee of ten percent (10%) of the costs incurred by such Subcontractor under Paragraphs 11.02 A.1 and 11.02 A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent (5%) of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.02 A.4, 11.02 A.5 and 11.02 B;

e. the amount of credit to be allowed by CONTRACTOR to CITY for any change which results in a net decrease in cost will be the amount of the actual net decrease in costs plus a deduction in CONTRACTOR's fee by an amount equal to five percent (5%) of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.01 D.2.a through 11.01 D.2.e, inclusive.

E. Whenever the Cost of the Work is to be determined pursuant to Paragraphs 11.02 A and B, CONTRACTOR shall establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to CITY an itemized cost breakdown together with supporting data.

11.02 Cost of the Work

A. The term "Cost of the Work" means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a request for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the request. Except as otherwise agreed to in writing by CITY, costs covered by Change Orders or requests shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any costs itemized in 11.02 B:

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work, using occupational titles and job classifications agreed upon by CITY and CONTRACTOR. Such employees shall include, without limitation, job Site superintendents, foremen and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing the Work after regular working hours, on Saturdays, Sundays or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated into the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless CITY deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to CITY. All trade discounts, rebates and refunds and returns from

sale of surplus materials and equipment shall accrue to CITY, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed or furnished by Subcontractors. If required by CITY, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to CITY who will then determine, with the advice of DESIGN PROFESSIONAL, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of the Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in Paragraphs 11.01 D and E and 11.02 A and B. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work when such services are approved in advance by CITY in writing.

5. Other costs including the following:

a. The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the Site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by CITY with the advice of DESIGN PROFESSIONAL, and the costs of transportation, loading, unloading, installation, assembly, dismantling and removal thereof, all in accordance with the terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

d. Applicable sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws or Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses required to perform the Work.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by CITY in accordance with Article 5), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of CITY. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for those services a fee proportionate to that stated in Paragraph 11.01 D.2.

g. The cost of utilities, fuel and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage and similar petty cash items in connection with the Work.

i. Cost of premiums for additional or increased Bonds, or for insurance required because of approved changes in the Work.

B. Costs excluded: The term "Cost of the Work" shall not include any of the following:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the Site or in CONTRACTOR's principal or a branch office for general administration of the Work (if not specifically included in the agreed upon occupational titles and job classifications referred to in Paragraph 11.02 A.1 or specifically covered by Paragraph 11.02 A.4), all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials, or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 11.02 A.

11.03 Cash Allowances

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to CITY. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment, an appropriate Change Order will be issued by CITY to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.04 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made in accordance with Paragraph 9.06.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. CITY or CONTRACTOR may negotiate an adjustment of the price per unit of Unit Price Work stated in the Contract if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs by twenty percent (20%) or more from the estimated quantity of such item indicated in the Contract; and
2. there is no corresponding adjustment with respect to any other item of Work; and
3. CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or CITY believes that CITY is entitled to a decrease in Contract Price.

11.05 Dispute Resolution

A. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price in accordance with Article 11 within fourteen (14) calendar days from the receipt of supporting documentation of the request pursuant to 11.01.B., unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted, then a Claim for such adjustment may be made pursuant to Article 16.

ARTICLE 12 CONTRACT TIMES

12.01 Time of the Essence

A. All times stated in the Contract Documents are of the essence of the Contract.

12.02 Change of Contract Times

A. The Contract Times (or Milestones) may only be changed by a Change Order. Any request for an adjustment in the Contract Times shall be based on written notice delivered within fourteen (14) calendar days after occurrence of the event giving rise to the request or within fourteen (14) calendar days after first recognition of the conditions giving rise to the request. Thereafter, the CONTRACTOR shall submit written documentation of its requests, including appropriate supporting documentation, within ten (10) days after giving notice, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted.

12.03 Proof Required To Justify an Extension of Time For Excusable and Compensable Delays

A. In support of any request for an extension of the Contract Times pursuant to this Article, CONTRACTOR must demonstrate to the reasonable satisfaction of the CITY that the critical path of the approved baseline project schedule was delayed. CONTRACTOR shall be entitled to an increase in contract time for the number of days that the critical path was delayed solely as a result of the compensable or excusable event. A compensable or excusable event includes, but is not limited to:

1. unreasonable delay of issuance of Notice to Proceed by CITY;
2. CITY's unreasonable delay of delivery furnished materials, equipment, or work;
3. unreasonable delay responding to shop drawings and submittals;
4. CITY's unreasonable delay in issuing a Change Order;
5. an order by the CITY to stop the Work where the CONTRACTOR was not at fault; and
6. other reasonable grounds as determined by the City in its sole discretion.

B. CONTRACTOR shall compare the critical path of the approved baseline project schedule to the actual critical path of the Work, identifying the specific impact of the compensable or excusable event.

C. CONTRACTOR shall submit to the CITY a written time impact analysis illustrating the influence of each compensable or excusable event on the date of Substantial Completion. The time impact analysis shall demonstrate the time impact based on the date of the delay in time and the event time computations or all affected activities.

D. If the critical path of the Work is delayed by "Force Majeure", the CONTRACTOR shall be entitled only to an extension of the Contract Times for the number of days of delay to the critical path. For purposes of this paragraph, "Force Majeure" shall mean fire, tornado, flood, earthquake, war, act of terrorism, civil disturbance, or labor strikes away from the project site.

E. Extensions of contract time pursuant to the this section will be granted only to the extent that the time adjustments exceed the total float time available when the event causing the delay occurred.

12.04 Delays Within CONTRACTOR's Control

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 Delays Beyond the CITY's and CONTRACTOR's Control

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both CITY and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 Delay Damages

A. In no event shall CITY be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR, or
2. delays beyond the control of CITY or CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this Paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inaction of CITY, DESIGN PROFESSIONAL, Consultant or anyone for whom CITY, DESIGN PROFESSIONAL or Consultant is responsible.

12.07 Dispute Resolution

A. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Time in accordance with Article 12 within fourteen (14) calendar days from the receipt of supporting documentation of the request pursuant to 12.02, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted, then a Claim for such adjustment may be made pursuant to Article 16.

ARTICLE 13 TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Access to Work

A. CITY, DESIGN PROFESSIONAL, Consultants, other representatives and personnel of CITY, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Site and Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and

advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.02 Tests and Inspections

A. CONTRACTOR shall give DESIGN PROFESSIONAL and CITY's Representative timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. If any Work (or the work of others at the Site) that is to be inspected, tested or approved is covered by CONTRACTOR without written approval required by Paragraphs 13.02 D or 13.02 E, it must, if requested by CITY's Representative, be uncovered for observation.

C. Uncovering Work as provided in Paragraph 13.02 B, shall be at CONTRACTOR's expense unless CONTRACTOR has given DESIGN PROFESSIONAL and CITY's Representative timely notice of CONTRACTOR's intention to cover the same and DESIGN PROFESSIONAL and CITY's Representative have not acted with reasonable promptness in response to such notice.

D. If Laws or Regulations of any public body (including City) having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish DESIGN PROFESSIONAL and CITY's Representative the required certificates of inspection or approval.

E. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for CITY's and DESIGN PROFESSIONAL's acceptance of materials or equipment to be incorporated into the Work, or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation into the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to CITY and DESIGN PROFESSIONAL.

F. CITY shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests or approvals covered by Paragraph 13.02 D and E;
2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04 B shall be paid as provided in said Paragraph 13.04 B; and
3. as otherwise specifically provided in the Contract Documents.

13.03 Notice of Defects

A. Prompt notice of all defective Work of which either CITY or DESIGN PROFESSIONAL has actual knowledge will be given to CONTRACTOR. Defective Work may be rejected, corrected or accepted as provided in this Article 13.

13.04 Uncovering Work

A. If any Work (or the work of others at the Site) is covered contrary to the written request of DESIGN PROFESSIONAL or CITY's Representative, it must, if requested by CITY's Representative, be uncovered for DESIGN PROFESSIONAL's or CITY's Representative's observation and replaced at CONTRACTOR's expense.

B. If CITY considers it necessary or advisable that covered Work be observed by DESIGN PROFESSIONAL or CITY's Representative or be inspected or tested by others, CONTRACTOR, at CITY's request, shall uncover, expose or otherwise make available for observation, inspection or testing as may be required, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and

charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefore as provided in Article 16.

13.05 CITY May Stop the Work

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, CITY may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of CITY to stop the Work shall not give rise to any duty on the part of CITY to exercise this right for the benefit of CONTRACTOR, any Subcontractor, Supplier, other individual or entity or any surety or employee or agent of any of them.

13.06 Correction or Removal of Defective Work

A. If required by CITY, CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by either DESIGN PROFESSIONAL or CITY's Representative, remove it and replace it with Work that is not defective. CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 Correction Period

A. If within one (1) year after the date of Substantial Completion, or such longer period of time as may be prescribed by Laws or Regulations, by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by CITY or permitted by Laws and Regulations as contemplated in Paragraph 6.10 is found to be defective, CONTRACTOR shall promptly, without cost to CITY and in accordance with CITY's written instructions:

1. correct the repair of damages to such land or areas; or
2. correct such defective Work, or if it has been rejected by CITY, remove it from the Site and replace it with Work that is not defective; and
3. satisfactorily correct or remove and replace any damage to other Work or to the work of others or damage to other lands or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in the event of an emergency where delay by CONTRACTOR would cause serious risk of loss or damage, CITY may have the defective Work corrected or the rejected Work removed and replaced, and all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one (1) year, or such longer period of time as may be prescribed within Paragraph 13.07 A, after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or waiver of the provisions of any applicable statute of limitation or repose.

13.08 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, CITY prefers to accept it, CITY may do so. CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to CITY's evaluation of and determination to accept such defective Work and shall pay OWNER for the diminished value of the Work. If any such acceptance occurs prior to DESIGN PROFESSIONAL's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work and, due to the diminished value of the Work, CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. If the acceptance of defective Work occurs after such recommendation, an appropriate amount shall be paid by CONTRACTOR to CITY.

13.09 CITY May Correct Defective Work

A. If CONTRACTOR fails within a reasonable time after written notice from DESIGN PROFESSIONAL or CITY's Representative to correct defective Work or to remove and replace rejected Work as required by CITY in accordance with Paragraph 13.06, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, CITY may, after seven (7) days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. CITY shall proceed expeditiously when exercising the rights and remedies under this Paragraph 13.09. In connection with such corrective and remedial action, CITY may exclude CONTRACTOR from all or part of the Site; take possession of all or part of the Work and suspend CONTRACTOR's services related thereto; take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site; and incorporate into the Work all materials and equipment stored at the Site or for which CITY has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow CITY, CITY's Representative, agents and employees, CITY's other contractors, DESIGN PROFESSIONAL and Consultants access to the Site to enable CITY to exercise the rights and remedies under this Paragraph 13.09.

C. All costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by CITY in exercising such rights and remedies will be charged against CONTRACTOR and a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work; and CITY shall be entitled to an appropriate decrease in the Contract Price. If CITY and CONTRACTOR are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. Such Claims for costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal and replacement of CONTRACTOR's defective or rejected Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by CITY of CITY's rights and remedies under Paragraphs 13.06 and 13.09.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

A. 01290.02 Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into form 01290.01 Application for Payment acceptable to DESIGN PROFESSIONAL and CITY. Progress payments for Unit Price Work will be based on the number of units completed.

14.02 Application for Progress Payments

A. Application for Payment

1. At least twenty (20) days before the date stipulated in the Supplementary Conditions for each progress payment (but not more often than once a month), CONTRACTOR shall submit to DESIGN PROFESSIONAL for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated into the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, paid invoice or other documentation warranting that CITY has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect CITY's interest therein, all of which will be subject to CITY's approval.

2. Beginning with the second Application for Payment, each Application shall include:

a. an affidavit of CONTRACTOR stating that all previous progress payments received for the Work have been applied to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment, and

b. a copy of the most recent 00485.01 M/WBE Monthly Utilization Report CONTRACTOR has submitted to the CITY's Human Relations Department.

c. a copy of the most recent 00485.02 Project Workforce Monthly Report and 00485.03 Company-Wide Workforce Monthly Report CONTRACTOR has submitted to the OWNER's Human Relations Department.

d. an update to the approved schedule pursuant to paragraphs 6.04 and 6.05.

3. The amount of retainage with respect to progress payments will be stated in the Supplementary Conditions.

B. Review of Applications

1. DESIGN PROFESSIONAL will, within ten (10) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to CITY, or return the Application to CONTRACTOR indicating in writing DESIGN PROFESSIONAL's reasons for refusing to recommend payment. In the latter case, CONTRACTOR shall make the necessary corrections and resubmit the Application.

a. After presentation of the Application for Payment to CITY, and if CITY's Representative agrees with DESIGN PROFESSIONAL's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02 B.4) become due and will be paid by CITY to CONTRACTOR, subject to the provisions of Laws or Regulations.

b. No payment shall be approved until the CONTRACTOR has submitted with the Application accompanying documentation as required by the Contract Documents, including, but not limited to, the documentation required by paragraphs 6.04 and 6.05.

2. DESIGN PROFESSIONAL's recommendation of any payment requested in an Application for Payment will constitute a representation by DESIGN PROFESSIONAL to

CITY, based on DESIGN PROFESSIONAL's observations of the executed Work as an experienced and qualified DESIGN PROFESSIONAL and on DESIGN PROFESSIONAL's review of the Application for Payment and the accompanying data and schedules, that to the best of DESIGN PROFESSIONAL's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
- b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.06, and to any other qualifications stated in the recommendation); and
- c. the conditions precedent to CONTRACTOR being entitled to such payment appear to have been fulfilled in so far as it is DESIGN PROFESSIONAL's responsibility to observe the Work.

3. DESIGN PROFESSIONAL's recommendation of any payment, including final payment, shall not mean that DESIGN PROFESSIONAL is responsible for CONTRACTOR's means, methods, techniques, sequence or procedures of construction, safety precautions and programs incident thereto, or any failure of CONTRACTOR to comply with Laws or Regulations applicable to the furnishing or performance of Work.

4. DESIGN PROFESSIONAL may refuse to recommend the whole or any part of any payment if, in DESIGN PROFESSIONAL's opinion, it would be incorrect to make the representations to CITY referred to in Paragraph 14.02 B.2. DESIGN PROFESSIONAL may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in DESIGN PROFESSIONAL's opinion to protect CITY from loss because:

- a. the Work is defective, or completed Work has been damaged requiring correction or replacement;
- b. the Contract Price has been reduced by Written Amendment or Change Orders;
- c. CITY has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. DESIGN PROFESSIONAL has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.

C. Reduction in Payment

1. CITY may refuse to make payment of the full amount recommended by DESIGN PROFESSIONAL because:

- a. Claims have been made by third parties against CITY on account of CONTRACTOR's performance or furnishing of the Work; or
- b. Claims have been made by CITY against CONTRACTOR in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to CITY to secure the satisfaction and discharge of such Claims;
- c. there are other items entitling CITY to a set-off against the amount recommended; or
- d. CITY has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02 B.4.a through c or 15.02 A.1 through 4; but CITY must give CONTRACTOR written notice (with a copy to DESIGN PROFESSIONAL) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by CITY and CONTRACTOR, when CONTRACTOR corrects to CITY's satisfaction the reasons for such action; or

e. CITY has made a different determination of the actual quantities and classifications of Unit Price Work.

14.03 CONTRACTOR's Warranty of Title

A. CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated into the Project or not, will pass to CITY no later than the time of payment, free and clear of all Liens.

14.04 Substantial Completion

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify CITY and DESIGN PROFESSIONAL in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that CITY issue a certificate of Substantial Completion. Within a reasonable time thereafter, CITY, together with CONTRACTOR and DESIGN PROFESSIONAL, shall make an inspection of the Work to determine the status of completion. If DESIGN PROFESSIONAL does not consider the Work substantially complete, DESIGN PROFESSIONAL will notify CONTRACTOR and CITY in writing giving the reasons therefore. If DESIGN PROFESSIONAL considers the Work substantially complete, DESIGN PROFESSIONAL will prepare and deliver to CITY a recommended certificate of Substantial Completion that shall establish the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. CITY shall have seven (7) days after receipt of the recommended certificate during which to make written objection to DESIGN PROFESSIONAL as to any provisions of the certificate or attached list. At the time of delivery of the recommended certificate of Substantial Completion, DESIGN PROFESSIONAL will deliver to CITY and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between CITY and CONTRACTOR with respect to security, operation, safety, protection of the Work, maintenance, heat, utilities, insurance and warranties and guarantees.

B. CITY shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but CITY shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.05 Partial Utilization

A. Use by CITY at CITY's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which CITY, DESIGN PROFESSIONAL and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by CITY for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

1. CITY at any time may request CONTRACTOR in writing to permit CITY to use any such part of the Work which CITY believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to CITY and DESIGN PROFESSIONAL that such part of the Work is substantially complete and request CITY to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify CITY and DESIGN PROFESSIONAL in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request CITY to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, CITY, together with CONTRACTOR and DESIGN PROFESSIONAL, shall make an inspection of that part of the Work to determine its status of completion. If DESIGN PROFESSIONAL does not consider that part of the Work to be substantially complete, DESIGN PROFESSIONAL will notify CITY and CONTRACTOR in writing, giving the reasons therefore. If DESIGN PROFESSIONAL considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to

certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of Paragraph 5.09 with respect to property insurance.

14.06 Final Inspection

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, DESIGN PROFESSIONAL will make a final inspection with CITY and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 Final Payment

A. Application for Payment

1. After CONTRACTOR has completed all corrections required by Paragraph 14.06 to the satisfaction of DESIGN PROFESSIONAL and CITY's Representative and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by Paragraph 5.04, certificates of inspection, marked-up record documents (as provided in Paragraph 6.13) and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation required by the Contract Documents, including but not limited to the evidence of insurance required by Subparagraph 5.04 B.7; and

b. 01290.14 "Contractor Affidavit for Final Payment" from CONTRACTOR and 01290.15 "Subcontractor Affidavit for Final Payment" from all Subcontractors, regardless of tier.

B. Review of Application and Acceptance

1. If, on the basis of DESIGN PROFESSIONAL's and CITY's Representative's observation of the Work during construction and final inspection, and DESIGN PROFESSIONAL's and CITY's Representative's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, DESIGN PROFESSIONAL and CITY's Representative are satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, DESIGN PROFESSIONAL will, within ten (10) days after receipt of the final Application for Payment, indicate in writing DESIGN PROFESSIONAL's and CITY's Representative's recommendation of payment and present the Application to CITY for payment. At the same time DESIGN PROFESSIONAL will also give written notice to CITY and CONTRACTOR that the Work is acceptable subject to the provisions of Paragraph 14.09.

2. Otherwise, DESIGN PROFESSIONAL will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application to DESIGN PROFESSIONAL. After the presentation to CITY of the Application and accompanying documentation, in appropriate form and substance, including applicable federal and state prevailing wage provisions, and with DESIGN PROFESSIONAL's recommendation and notice of acceptability, the amount recommended by DESIGN PROFESSIONAL will become due and will be paid by CITY to CONTRACTOR in accordance with Laws and Regulations.

14.08 Final Completion Delayed

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if DESIGN PROFESSIONAL so recommends and CITY concurs, CITY shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of DESIGN PROFESSIONAL, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by CITY for Work not fully completed or corrected is less than the retainage stipulated in the Supplementary Conditions, and if Bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to DESIGN PROFESSIONAL with the Application for Payment. Payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

A. The making and acceptance of final payment will constitute:

1. a waiver of all claims by CITY against CONTRACTOR, except claims previously made in writing and still unsettled, or claims arising from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against CITY other than those previously made in writing pursuant to Paragraphs 16.02 and 16.03 and still unsettled.

14.10 Completion of Work by CITY

A. If CITY must complete the Work, all costs and charges incurred by CITY, together with the cost of completing the Work under the Contract, will be deducted from any monies due or which may become due CONTRACTOR. If such expense exceeds the sum which would have been payable under the Contract, then CONTRACTOR and the surety shall be liable and shall pay to CITY the amount of such excess.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.01 CITY May Suspend Work

A. Notwithstanding any other provision of this Contract, at any time and without cause, and at its sole and absolute discretion, CITY, may suspend the Work or any portion of the Work by written notice to CONTRACTOR, which will initially fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed in the notice unless the date is changed by a subsequent written notice from CITY. CONTRACTOR may be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any suspension if CONTRACTOR makes a Claim therefore in accordance with Article 16.

B. CONTRACTOR will not be allowed an adjustment in the Contract Price or an extension of the Contract Times if CITY suspends the Work because CONTRACTOR's acts or omissions create or cause an emergency that CITY believes affects the safety or protection of persons, the Work, or property at the Site or adjacent thereto. CITY may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been adequately addressed by CONTRACTOR; however, this right of CITY to stop the Work shall not give rise to any duty on the part of CITY to exercise this right for the benefit of CONTRACTOR, any Subcontractor, Supplier, other individual or entity or any surety or employee or agent of any of them.

15.02 CITY May Terminate for Default

A. CONTRACTOR may be deemed in default and CITY may terminate the services of CONTRACTOR upon the occurrence of any one or more of the following events:

1. CONTRACTOR fails to perform the Work in accordance with the Contract Documents

(including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under Paragraph 2.06 and 2.07 as adjusted from time to time pursuant to Paragraphs 6.04, 6.05, 12.02 and 12.03);

2. CONTRACTOR abandons the Work or declares its intention to abandon the Work;
3. CONTRACTOR assigns or attempts to assign its rights or obligations under this Contract or any part thereof to any third party without the prior written consent of CITY;
4. CONTRACTOR fails to make prompt payment duly owing to any subcontractor for Work completed in accordance to the Contract Documents or material supplier for materials delivered for incorporation into the Work within thirty (30) calendar days after payment was due;
5. CONTRACTOR fails to achieve the required dates of substantial and final completion;
6. CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;
7. CONTRACTOR disregards the authority of DESIGN PROFESSIONAL or OWNER;
or
8. CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents.

B. CITY may, after giving CONTRACTOR (and the surety) seven (7) days written notice and to the extent permitted by Laws or Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the Site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate into the Work all materials and equipment stored at the Site or for which CITY has paid CONTRACTOR but which are stored elsewhere, and finish the Work as CITY may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CITY arising out of or resulting from completing the Work, such excess may be paid to CONTRACTOR. If such costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to CITY within fourteen (14) calendar days of CITY'S demand for payment. When exercising any rights or remedies under this Paragraph CITY shall not be required to competitively bid this work unless required by law.

C. Where CONTRACTOR's services have been so terminated by CITY, the termination will not affect any rights or remedies of CITY against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by CITY will not release CONTRACTOR from liability.

D. If, after a default termination, it is determined that the CONTRACTOR was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the CITY. The CITY shall then be liable to CONTRACTOR for only those costs enumerated in paragraph 15.03.

15.03 CITY May Terminate for Convenience

A. Notwithstanding any other provision of this Contract, upon seven (7) calendar days written notice to CONTRACTOR, CITY may, at its sole and absolute discretion, without cause and without prejudice to any other right or remedy of CITY, elect to terminate the Contract. In such case, CONTRACTOR shall, with thirty (30) calendar days of receiving notice of termination under this paragraph, submit to CITY its statement of costs and expenses and shall be paid:

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

4. for reasonable expenses directly attributable to termination if approved in advance by CITY.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

C. CONTRACTOR waives any costs not submitted to CITY pursuant to paragraph 15.03.A.

D. CITY shall, within thirty (30) calendar days after receipt of CONTRACTOR's statement, pay CONTRACTOR all amounts it determines are properly determined.

ARTICLE 16 CLAIMS AND DISPUTES

16.01 Definition

A. A Claim is a demand or assertion by the CONTRACTOR seeking, as a matter of right, the adjustment of Contract price and/or times with respect to the terms of the Contract.

16.02 Written Notice and Burden of Proof

A. Claims must be made by written notice pursuant to Paragraph 17.01. The written notice shall clearly indicate that the CONTRACTOR is making a claim. The responsibility to substantiate Claims shall rest with the CONTRACTOR. No Claim may be made under this Contract except as provided in this Article.

B. Certification of Claim: The written notice of Claim shall include the following statement signed by the CONTRACTOR's representative: "The CONTRACTOR certifies that all statements made and the facts set out in this claim are true and correct and that no false records have been submitted in support of this claim." **Strict compliance with this paragraph shall be a condition precedent to the creation, existence or validity of any Claim.**

16.03 Time Limits on Claims

A. The CONTRACTOR must give notice to the CITY within fourteen (14) calendar days after the denial of a request for or failure to reach an agreement on a change in Contract Price and/or change in Contract Time pursuant to Article 11 and Article 12 respectively. After the fourteen (14) day period for making Claims has expired, the Claim shall be considered waived.

B. The CONTRACTOR shall submit the Claim to the CITY's Representative.

16.04 Continuing Contract Performance

A. Pending final resolution of a Claim, unless otherwise agreed in writing, the CONTRACTOR shall proceed diligently with performance of the Work and the CITY shall continue to make payments in accordance with the Contract Documents. The CITY may, but is not obligated to, notify the Surety of the nature and amount of the Claim.

16.05 Injury or Damage to Person or Property

A. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts that party is legally liable, written notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding thirty

(30) days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter.

16.06 Initial Resolution of Claims and Disputes

A. After the CONTRACTOR has submitted the Claim to the CITY'S Representative, the CITY'S Representative and CONTRACTOR'S Representative shall conduct a settlement conference within fourteen (14) calendar days from the date of receipt of the Claim. If the Claim is not settled within seven (7) calendar days following the date of the settlement conference, the CITY'S Representative and the CONTRACTOR'S Representative shall state, in writing, following the conclusion of the seven (7) calendar day period, their respective position as to the matters in dispute.

B. The CITY'S and CONTRACTOR'S statement of positions shall state all known factual grounds for each party's position. If the dispute remains unresolved at the end of the seven (7) calendar days from submission of the parties' written position statements, the CONTRACTOR shall have the right to proceed with the pursuit of Claims pursuant to paragraph 16.07.

C. If a Claim has been resolved, the OWNER will prepare or obtain appropriate documentation.

16.07 Final Resolution of Claims and Disputes

A. All administrative procedures set forth in this contract must first be exhausted before suit is filed.

B. If the CITY'S Representative and the CONTRACTOR'S Representative are unable to resolve the dispute pursuant to 16.06, the parties must submit their statements of position to the Director, who shall review the Claim and make a decision within fourteen (14) calendar days.

C. Absent fraud, gross mistake or bad faith, the Director's decision shall be final and binding on CITY and CONTRACTOR within fourteen (14) calendar days after issuance. The CONTRACTOR shall give written notice to the CITY stating its intent to submit its Claim to a court of law pursuant to paragraph 17.05.A. within thirty (30) calendar days after notice of Director's decision.

D. The time frames for the Director's decision and for CONTRACTOR'S written notice of intent may be tolled by participation in voluntary mediation. Mediator selection and the procedures to be employed in voluntary mediation shall be mutually acceptable to the parties. Costs of the mediator shall be shared equally among the parties participating in the mediation. In no event shall any time frame be tolled more than 30 days for mediation. However, mediation may be employed at any time at the discretion and mutual agreement of the parties.

E. If the dispute is not resolved during voluntary mediation, The CONTRACTOR agrees that it will file no suit based on facts or evidentiary materials that were not presented for consideration to the CITY during the mediation process or of which the CONTRACTOR had knowledge and failed to present during the administrative procedures.

ARTICLE 17 MISCELLANEOUS

17.01 Giving Notice

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be given by personal delivery, by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice or by confirmed electronic facsimile transmission. Notice is effective on the date of personal delivery, deposit of registered or certified mail, postage prepaid, or confirmed electronic facsimile transmission.

17.02 Computation of Times

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last calendar day of such period. If the last day of such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 Cumulative Remedies

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR and all of the rights and remedies available to CITY and DESIGN PROFESSIONAL hereunder are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

17.04 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract.

17.05 Controlling Law

A. This Contract shall be construed and governed in accordance with the laws of the State of Missouri without giving effect to Missouri's choice of law provisions. The CITY and CONTRACTOR: (1) shall submit exclusively to the jurisdiction of the state and federal courts located in Jackson County, Missouri and no other; (2) shall waive any and all objections to jurisdiction and venue; and (3) shall not raise forum non conveniens as an objection to the location of any litigation.



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ARTICLE 1 DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

A. Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1. Addenda - Written or graphic instruments issued prior to the opening of Bids that clarify, correct or change the Bidding Requirements or the Contract Documents.

2. Agreement—The written Contract between CITY and CONTRACTOR governing the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

3. Application for Payment—The form accepted by CITY's Representative which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. Asbestos - Any material that contains more than one percent (1%) Asbestos and is friable or is releasing Asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. Bid- The offer or proposal of the Bidder submitted on the Bid Form/Contract setting forth the prices for the Work to be performed. A Bidder's Bid becomes a Contract with CITY if the CITY executes the Bid Form/Contract submitted by Bidder. If the CITY executes the Bid Form/Contract submitted by Bidder, the term "Bidder" shall mean CONTRACTOR.

6. Bidder- One who submits a Bid directly to CITY, as distinct from a sub-bidder who submits a bid to a Bidder. If the CITY executes the Bid Form/Contract submitted by Bidder, the term "Bidder" shall mean CONTRACTOR in both the Bidding Documents and Contract Documents unless the context clearly indicates otherwise.

7. Bidding Documents- The advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form/Contract, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

8. Bidding Requirements- The advertisement or invitation to bid, Instructions to Bidders, Bid security, and the Bid Form/Contract with any supplements.

9. Bonds- Payment Bond and Performance and Maintenance Bond and other instruments of security.

10. Calendar Day- Any day shown on the calendar, including Saturdays, Sundays, and holidays.

11. Change Order- A written document issued by CITY that authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Contract.

12. CITY/OWNER- Kansas City, Missouri, a constitutionally chartered municipal corporation, with which CONTRACTOR has entered into the Contract and for whom the Work is to be provided.

13. CITY's Representative- Person or agency designated to act for the Director as provided in these Contract Documents.

14. Consultant- Person, firm or corporation having a contract with CITY or DESIGN PROFESSIONAL to furnish services as an independent professional associate or Consultant with respect to the Project and who's identified as such in the Supplementary Conditions.

The Consultant(s) is identified and their seals affixed on the Certification Page(s). The certifications describe the respective responsibilities for the Drawings and Specifications prepared by the Consultant(s) and are incorporated into this Contract.

15. Contract- The entire and integrated written agreement between CITY and CONTRACTOR concerning the Work that incorporates all Contract Documents. The Bid Form/Contract submitted by Bidder is the Contract between CITY and CONTRACTOR upon execution by CITY. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

16. Contract Documents- The Contract Documents establish the rights and obligations of the parties and include the Contract, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid Form/Contract (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Intent to Contract), the Construction Project Instructions, the Contractor's Utilization Plan/Request for Waiver, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Project Manual and the certification page(s) of the DESIGN PROFESSIONAL and Consultant(s), together with approved project baseline schedule and amendments thereto and all Written Amendments, Change Orders, Work Change Directives, and DESIGN PROFESSIONAL's written interpretations and clarifications issued on or after the Effective Date of the Contract, and approved Shop Drawings. Reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this Paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by CITY to CONTRACTOR are not Contract Documents, except project schedules submitted by CONTRACTOR and approved by CITY.

17. Contract Price- The money payable by CITY to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement.

18. Contract Times- The number of days or the dates stated in the Supplementary Conditions: (a) to achieve Substantial Completion, and (b) to complete the Work so that it is ready for final payment as evidenced by CITY's Representative's written recommendation of final payment.

19. CONTRACTOR- The person, firm, partnership, company, corporation or association licensed or otherwise authorized by law to do business in Missouri, with whom CITY has entered into the Agreement.

20. Day- Shall constitute a Calendar Day.

21. DESIGN PROFESSIONAL- Architect, Engineer or other licensed professional who is either employed by or has contracted with CITY to serve in a design capacity and whose Consultants, members, partners, employees or agents have prepared and sealed the Drawings and Specifications.

The DESIGN PROFESSIONAL(s) is identified and their seals affixed on the Certification Page(s). The certifications describe the respective responsibilities for the Drawings and Specifications prepared by the DESIGN PROFESSIONAL and are incorporated into this Contract.

22. DESIGN PROFESSIONAL's Project Representative- The authorized representative of DESIGN PROFESSIONAL who may be assigned to the Site or any part thereof.

23. Director- The term Director shall mean the duly appointed executive officer of a department of City who is empowered by the City Charter or by the City Council to enter into a contract on behalf of City, or to grant a permit for improvements to land owned by City. A Director is authorized to delegate this authority to a City employee so designated in writing.

24. Drawings- The drawings which graphically show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared by DESIGN PROFESSIONAL and are included in the Contract Documents. Shop Drawings are not Drawings as so defined.

25. Effective Date of the Contract- The date indicated in the Contract on which it becomes effective, but if no such date is indicated it means the date on which the Contract is fully executed by CITY.

26. General Requirements- Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

27. Hazardous Environmental Condition- The presence at the Site of Asbestos, Lead-Based Paint, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

28. Hazardous Waste- The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

29. Laws or Regulations- Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

30. Lead-Based Paint- Any paint, varnish, stain, or other applied coating that has one (1) mg or more of lead per square centimeter. The terms "leaded paint" and "lead-containing paint" are synonymous with Lead-Based Paint.

31. Liens- Liens, charges, security interests or encumbrances upon real property or personal property.

32. Milestone- A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

33. Notice of Intent to Contract- The written notice by CITY to the apparent successful Bidder stating that upon compliance by that apparent successful Bidder with the conditions in the Bid Documents enumerated, within the time specified, and upon enactment of an appropriate ordinance or resolution, CITY will sign and deliver the Contract.

34. Notice to Proceed- A written notice given by CITY to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

35. Partial Utilization- Use by CITY of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

36. PCBs- Polychlorinated biphenyls.

37. Petroleum- Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

38. Project- The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

39. Project Manual- The documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual may be issued in one or more volumes and is contained in the table(s) of contents.

40. Radioactive Material- Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

41. Samples- Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

42. Shop Drawings- All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

43. Site- Lands or areas indicated in the Contract Documents as being furnished by CITY upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by CITY which are designated for the use of CONTRACTOR.

44. Specifications- Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

45. Subcontractor- Any individual, firm, partnership, company, corporation or association licensed or otherwise authorized by law to do business in Missouri, to whom CONTRACTOR, with written notification to CITY, has entered into an agreement to perform a part of the Work.

46. Substantial Completion- When Work (or a specified part thereof) has progressed to the point where, in the opinion of DESIGN PROFESSIONAL as evidenced by DESIGN PROFESSIONAL's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

47. Supplementary Conditions- The part of the Contract Documents which amends and/or supplements these General Conditions.

48. Supplier- A manufacturer, fabricator, supplier, distributor, materialman or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated into the Work by CONTRACTOR or any Subcontractor.

49. Underground Facilities- All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. Unit Price Work- Work to be paid for on the basis of unit prices.

51. Work- The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor, and furnishing and incorporating material and equipment into the construction, and furnishing documents, all as required by the Contract Documents.

52. Work Change Directive- A written directive to CONTRACTOR, issued on or after the Effective Date of the Contract, signed by CITY and recommended by DESIGN PROFESSIONAL, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed, or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed or

documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

53. Work Day - Any day during which the CONTRACTOR is able to work a period of six (6) hours or more. Days that are not Work Days are days during which the CONTRACTOR is unable to work for a period of six (6) hours by reason of strikes, boycotts, labor disputes, embargoes, unusual delays in transportation or shortage of material, acts of God, acts of the public enemy, acts of superior governmental authority, weather conditions, riots, rebellion, sabotage, or any other circumstances for which CONTRACTOR is not responsible or which is not within its control. Saturdays, Sundays, and holidays on which the CONTRACTOR's forces engage in Work requiring the presence of an inspector, will be considered as Work Days.

54. Written Amendment- A written statement modifying the Contract Documents, signed by CITY and CONTRACTOR on or after the Effective Date of the Contract and normally dealing with the non-engineering or non-technical rather than strictly construction-related aspects of the Contract Documents.

1.02 Terminology

A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of DESIGN PROFESSIONAL as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to DESIGN PROFESSIONAL any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.08 or any other provision of the Contract Documents.

B. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to CITY 's Representative's recommendation of final payment (unless responsibility for the protection thereof has been assumed by CITY at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

C. Furnish, Install, Perform, Provide

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, “provide” is implied.

D. Unless stated otherwise in the Contract Documents, words and phrases which have a well-known technical or construction industry or trade meanings are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 PRELIMINARY MATTERS

2.01 Delivery of Bonds

A. CONTRACTOR shall deliver to CITY such Bonds as CONTRACTOR may be required to furnish.

2.02 Evidence of Insurance

A. CONTRACTOR shall deliver to CITY certificates of insurance or other evidence of insurance that CITY may request, which CONTRACTOR is required to purchase and maintain in accordance with Article 5 or any other applicable provision in the Contract Documents.

2.03 Copies of Documents

A. CITY shall furnish to CONTRACTOR one (1) copy of the Drawings and Specifications, including addenda.

2.04 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the date indicated in the Notice to Proceed.

2.05 Starting the Work

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the Site prior to the date on which the Contract Times commence to run, unless otherwise indicated in the Notice to Proceed.

2.06 Before Starting Construction

A. CONTRACTOR's Review of Contract Documents: Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to DESIGN PROFESSIONAL any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from DESIGN PROFESSIONAL before proceeding with any Work affected thereby. CONTRACTOR shall not be liable to CITY or DESIGN PROFESSIONAL for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless CONTRACTOR knew or reasonably should have known thereof.

B. Preliminary Schedules: Within ten (10) days after the Effective Date of the Contract, or on such later date as CITY's Representative shall provide in writing, CONTRACTOR shall submit to CITY's Representative for review:

1. Preliminary Project Schedule: CONTRACTOR shall submit a proposed project schedule for CITY's acceptance. The proposed project schedule shall include a detailed and comprehensive construction schedule utilizing a critical path method diagram network that (a) shows all major procurement and construction elements and phases of the Project; (b) breaks down each element or phase by trade; (c) shows early and late starts so that all float time will be accurately identified; (d) all other activities necessary for the timely completion of the Project in accordance with the scheduled dates for Substantial and Final Completion; and (e) highlights the project's critical path. CITY's acceptance is expressly limited to CITY's acknowledgement that, based upon CITY's limited review, the dates of Substantial

Completion and Milestone dates are acceptable. After final acceptance of the preliminary project schedule by the CITY, it shall be considered the project baseline schedule pursuant to Paragraph 2.07(B).

2. Preliminary schedule of Shop Drawings and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal; and

3. Preliminary 01290.02 Schedule of Values for all of the Work which will include quantities and prices of items which when added together equals the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. Preconstruction Conference: Before any Work at the Site may be started, a conference attended by CONTRACTOR, DESIGN PROFESSIONAL and others, as appropriate, will be scheduled by CITY's Representative to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.06 B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, maintaining required records, Claims process, dispute resolution or any other applicable provisions of the Contract Documents.

2.07 Acceptable Schedules

A. Acceptable schedule: The Contractor shall update and submit to the CITY for review the preliminary schedule within seven (7) Calendar Days after the Notice to Proceed.

1. The CITY shall review and make any necessary comments and/or adjustments to the updated preliminary schedule. The Contractor shall incorporate the CITY's comments and resubmit the updated preliminary schedule within seven (7) Calendar Days from receipt of the CITY's comments.

B. Project Baseline Schedule: The accepted updated preliminary schedule shall be considered the project baseline schedule and shall be used by the CONTRACTOR for planning, scheduling, managing, and executing the Work. The project baseline schedule shall not be changed without the written consent of CITY. The project baseline schedule may be further modified by the Supplemental Conditions.

C. CONTRACTOR's schedule of values will be acceptable to CITY's Representative as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 CONTRACT DOCUMENTS : INTENT, AMENDING, REUSE

3.01 Intent

A. The Contract Documents comprise the entire Contract between CITY and CONTRACTOR concerning the Work.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for at no additional cost to CITY. Clarifications and interpretations of the Contract Documents shall be issued by DESIGN PROFESSIONAL as provided in Paragraph 9.03.

C. Correlation and intent of documents: The Drawings and Specifications are intended to supplement each other. Any Work shown on the Drawings and not mentioned in the Specifications (or vice versa) shall be as binding and shall be completed the same as if mentioned or shown on both. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

1. Change Orders and Written Amendments
2. Project Baseline Schedule Requirements
3. Approved Shop Drawings
4. Addenda, with those of later date having precedence over those of earlier date
5. The Supplementary Conditions
6. The General Conditions
7. Drawings and Specifications

D. In the case of an inconsistency between Drawings and Specifications, the requirements of the Specifications shall govern. If Drawings are in conflict, larger scale details shall govern over smaller or no-scale Drawings. If Specification sections are in conflict with each other, the conflict shall be resolved by DESIGN PROFESSIONAL in accordance with reasonable interpretation of such documents.

E. The general character of the detailed Work is shown on the Drawings, but minor modifications may be made in the full size or scale details. Where the word "similar" occurs on the Drawings, it shall be used in its general sense and not as meaning identical, and all details shall be worked out in relation to their location and their connection to the other parts of the Work. Where on any Drawings a portion of the Work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to all other like portions of the Work. Where ornaments or other details are indicated by starting only, such details shall be continued throughout the courses or parts in which they occur and shall also apply to all other similar parts in the Work, unless otherwise indicated.

3.02 Reference to Standards and Specifications of Technical Societies

A. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or on the date of CONTRACTOR's proposal if there are no Bids), except as may be otherwise specifically stated in the Contract Documents.

1. No provision of any such standard, specification, manual, code or instruction of Supplier shall be effective to change the duties or responsibilities of CITY, CONTRACTOR or DESIGN PROFESSIONAL, or any of their Subcontractors, Consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to CITY or DESIGN PROFESSIONAL or any of their Consultants, agents or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies: If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Laws or Regulations applicable to the performance of the Work or of any standard, specification, manual, code or any instruction of any Supplier referred to in Paragraph 6.07, CONTRACTOR shall report it immediately to DESIGN PROFESSIONAL in writing. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by Paragraph 6.17) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to CITY or DESIGN PROFESSIONAL for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. Resolving Discrepancies. The provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and:

1. the provisions of any standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
2. the provisions of any Laws or Regulations applicable to the performance of the Work.

3.04 Amending and Supplementing Contract Documents

A. The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

1. a Written Amendment or
2. a Change Order (pursuant to Article 10), whether pursuant to a Work Change Directive or otherwise.

B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, in one or more of the following ways

1. DESIGN PROFESSIONAL's approval of a Shop Drawing or Sample (pursuant to Paragraph 6.18), or
2. DESIGN PROFESSIONAL's written interpretation or clarification (pursuant to Paragraph 9.03).

3.05 Reuse of Documents

A. CONTRACTOR and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under this Contract:

1. shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of DESIGN PROFESSIONAL or Consultant, and
2. shall not reuse any of such Drawings, Specifications, other documents or copies thereof on extensions of the Project or any other project without written consent of CITY, and of DESIGN PROFESSIONAL or Consultant, as applicable, and specific written verification or adaptation by DESIGN PROFESSIONAL or Consultant.

This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.01 Availability of Lands

A. CITY shall furnish the Site. CITY shall identify any encumbrances or restrictions not of general application but specifically related to use of lands so furnished with which CONTRACTOR will have to comply in performing the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by CITY, unless otherwise provided in the Contract Documents. If CONTRACTOR and CITY are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times or both as a result of any delay in CITY's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a Claim as provided in Article 16. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 Subsurface and Physical Conditions

A. Reports and Drawings: Reference is made to the Supplementary Conditions for identification of:

1. Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents; and
2. Physical Conditions: Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents.

B. Limited Reliance by CONTRACTOR on Technical Data Authorized: CONTRACTOR may rely upon the general accuracy of the technical data contained in reports and drawings of subsurface or physical conditions, but such reports and drawings are not Contract Documents. The technical data is identified in the Supplementary Conditions. Except for reliance on such technical data, CONTRACTOR may not rely upon or make any Claim against CITY, DESIGN PROFESSIONAL or any Consultant with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or
3. any CONTRACTOR interpretation of or conclusion drawn from any technical data or any such other data, interpretations, opinions or information.

4.03 Differing Subsurface or Physical Conditions

A. Notice of Differing Subsurface or Physical Conditions. If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any technical data on which CONTRACTOR is entitled to rely as provided in Paragraphs 4.02 A and 4.02 B is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.17), notify CITY and DESIGN PROFESSIONAL in writing about such condition(s). CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. DESIGN PROFESSIONAL's Review: After receipt of notice as required by Paragraph 4.03 A, DESIGN PROFESSIONAL will promptly review the pertinent conditions, determine the necessity for CITY to obtain additional exploration or tests with respect thereto and notify CITY in writing (with a copy to CONTRACTOR) of DESIGN PROFESSIONAL's findings and conclusions.

C. Possible Contract Documents Change: If CITY concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in Paragraph 4.03 A, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

D. Possible Price or Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of a subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

1. the condition must meet any one or more of the categories described in Paragraphs 4.03 A.1 through 4.03 A.4, inclusive;
2. a change in the Contract Documents pursuant to Paragraph 4.03 C will not be an automatic authorization of, nor a condition precedent to, entitlement to any such adjustments;
3. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.06 and 11.04; and
4. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if;
 - a. CONTRACTOR knew, or by the exercise of ordinary care could have known, of such conditions at the time CONTRACTOR made a final commitment to CITY with respect to Contract Price and Contract Times by the submission of a Bid; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or
 - c. CONTRACTOR failed to give the written notice as required by Paragraph 4.03 A.

E. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price pursuant to Article 11 and/or Contract Times pursuant to Article 12, a Claim may be made therefore as provided in Article 16. However, CITY, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04. Physical Conditions – Underground Facilities

A. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to CITY or DESIGN PROFESSIONAL by the owners of such Underground Facilities or by others.

1. CITY and DESIGN PROFESSIONAL shall not be responsible for the accuracy or completeness of any such information or data; and
2. The cost of all of the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for:
 - a. reviewing and checking all such information and data,
 - b. locating all Underground Facilities shown or indicated in the Contract Documents,
 - c. coordination of the Work with the owners of such Underground Facilities during construction, and
 - d. the safety and protection of all such Underground Facilities as provided in Paragraph 6.14 and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated: If an Underground Facility is uncovered or revealed at or contiguous to the Site, and was not shown or indicated in the Contract Documents, or was

shown or indicated incorrectly in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.17), identify the owner of such Underground Facility and give written notice to that owner and to CITY and DESIGN PROFESSIONAL.

C. DESIGN PROFESSIONAL's Review: After receipt of notice as required by Paragraph 4.04 B, DESIGN PROFESSIONAL will promptly review the consequences of the existence of the Underground Facility and notify CITY in writing (with a copy to CONTRACTOR) of DESIGN PROFESSIONAL's findings and conclusions.

D. Possible Contract Documents Change: If CITY concludes that a change in the Contract Documents is required as a result of the existence of an Underground Facility that either was not shown, or was shown incorrectly, in the Contract Documents, a Work Change Directive or Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

E. Possible Price or Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of the Underground Facility causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

1. a change in the Contract documents pursuant to Paragraph 4.04 D will not be an automatic authorization of, nor a condition precedent to, entitlement to any such adjustments;
2. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.06 and 11.04; and
3. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if;
 - a. CONTRACTOR knew, or by the exercise of ordinary care could have known, of the existence of the Underground Facility at the time CONTRACTOR made a final commitment to CITY with respect to Contract Price and Contract Times by the submission of a Bid; or
 - b. the existence of the Underground Facility could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or
 - c. CONTRACTOR failed to give the written notice as required by Paragraph 4.04 B.

F. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price pursuant to Article 11 and/or Contract Times pursuant Article 12, a Claim may be made therefore as provided in Article 16. However, CITY, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.05 Reference Points

A. CITY shall provide engineering surveys to establish reference points for construction that in DESIGN PROFESSIONAL's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of CITY. CONTRACTOR shall report to DESIGN PROFESSIONAL whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be

responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 Asbestos, Lead-Based Paint, PCBs, Petroleum, Hazardous Waste or Radioactive Material

A. Reports and Drawings: Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the DESIGN PROFESSIONAL in the preparation of the Contract Documents.

B. Limited Reliance by CONTRACTOR on Technical Data Authorized: CONTRACTOR may rely upon the general accuracy of the technical data contained in reports and drawings relating to a Hazardous Environmental Condition at the Site, but such reports and drawings are not Contract Documents. Such technical data is identified in the Supplementary Conditions. Except for such reliance on such technical data, CONTRACTOR may not rely upon or make any Claim against CITY, DESIGN PROFESSIONAL or any Consultant with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
3. any CONTRACTOR interpretation of or conclusion drawn from any technical data or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for all Hazardous Environmental Conditions created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible. CONTRACTOR shall not be entitled to an extension of the Contract Times or an increase in the Contract Price if CONTRACTOR, Subcontractor, Supplier or anyone for whom CONTRACTOR is responsible created any Hazardous Environmental Condition at the Site or in connection with the Work.

D. If CONTRACTOR encounters a Hazardous Environmental Condition at the Site or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition at the Site, CONTRACTOR shall immediately:

1. secure or otherwise isolate such condition;
2. stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6. 15); and
3. notify CITY and DESIGN PROFESSIONAL (and promptly thereafter confirm such notice in writing). CITY shall promptly consult with DESIGN PROFESSIONAL concerning the necessity for CITY to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall neither resume Work nor be required to resume Work in connection with such condition or in any affected area until after CITY has obtained any required permits related thereto and delivered to CONTRACTOR written notice:

1. specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or
2. specifying any special conditions under which such Work may be resumed safely. If CITY and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price pursuant to Article 11 and/or Contract Times to

pursuant to Article 12 as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, a Claim may be made therefore as provided in Article 16.

F. If after receipt of written notice as required in Paragraph 4.06 E, CONTRACTOR does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under special conditions specified in the notice, then CITY may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If CITY and CONTRACTOR cannot agree as to entitlement to or magnitude of an equitable adjustment in Contract Price pursuant to Article 11 and/or Contract Times pursuant to Article 12 as a result of deleting such portion of the Work, then a Claim may be made therefore as provided in Article 16. CITY may have such deleted portion of the Work performed by CITY's own forces or others in accordance with Article 7.

G. The provisions of Paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

H. All materials used, whether new or salvaged, shall be asbestos-free materials. CONTRACTOR shall immediately call to the attention of the CITY's Representative any specified material or product which the CONTRACTOR knows or suspects to contain asbestos, whether new or salvaged.

ARTICLE 5 BONDS AND INSURANCE

5.01 Performance, Payment and Other Bonds

A. CONTRACTOR shall furnish Performance and Maintenance and Payment Bonds, each in an amount at least equal to the Contract Price, as set out in the Contract Documents, as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one (1) year after the date when final payment of the Contract becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations. A certified copy of the agent's authority to act must accompany all Bonds signed by an agent.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirement of Paragraph 5.01 B, CONTRACTOR shall within twenty (20) days thereafter substitute another Bond and surety, both of which must be acceptable to CITY.

5.02 Licensed Sureties and Insurers

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by CITY or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed in the State of Missouri and in the jurisdiction in which the Project is located, if not in Missouri, to issue Bonds or insurance policies for the limits and coverages so required. All surety and insurance companies shall hold an A.M. Best rating of A-, V, or better.

5.03 Certificates of Insurance

A. CONTRACTOR shall deliver to CITY and DESIGN PROFESSIONAL, prior to the start of any Work at the Project Site, properly completed certificates of insurance or other evidence that the required insurance is in full force and effect, in a form acceptable to CITY. The receipt or acceptance of a certificate of insurance that does not incorporate the required terms and coverage shall not constitute a waiver by the City of the insurance requirements contained in the Contract Documents.

B. All policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained by CONTRACTOR in accordance with Paragraphs 5.04 and 5.06 will contain waiver provisions in accordance with Paragraph 5.07 A. The certificates of insurance will contain a provision stating that should any of the policies described in the certificate be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions.

C. If the coverage afforded is cancelled or changed or its renewal is refused, CONTRACTOR shall give at least thirty (30) days prior written notice to CITY and to each other additional insured to whom a certificate of insurance has been issued.

5.04 CONTRACTOR's Liability Insurance

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and furnished, and will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits and other similar employee benefit acts;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;
3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;
4. claims for damages insured by customary personal injury liability coverage;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefore; and
6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by Paragraph 5.04 A, to be purchased and maintained shall:

1. with respect to insurance required by Paragraphs 5.04 A.3 through 5.04 A.5 inclusive, include as additional insureds (subject to any customary exclusion for professional liability) CITY, DESIGN PROFESSIONAL, Consultants and any other individuals or entities identified in the Supplementary Conditions to be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
2. include at least the specific coverages and be written for not less than the limits of liability provided in Paragraph 5.04 C or required by Laws or Regulations, whichever is greater;
3. include completed operations insurance;
4. include contractual liability insurance covering CONTRACTOR's indemnity obligations;
5. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing defective Work in accordance with Paragraphs 13.06 and 13.07;

6. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two (2) years after final payment (and CONTRACTOR shall furnish CITY and each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued evidence satisfactory to CITY and any such additional insured of continuation of such insurance);

7. contain a cross-liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance;

8. with respect to commercial automobile liability, commercial general liability, and umbrella liability insurance, CONTRACTOR shall require its insurance carrier(s) to waive all rights of subrogation against CITY, and CITY's officers, directors, partners, employees and agents; and

9. contain a provision or endorsement that the costs of providing the insureds a defense and appeal, including attorneys' fees, as insureds, shall be supplementary and shall not be included as part of the policy limits but shall remain the insurer's responsibility.

C. Specific policies of insurance required by this Paragraph 5.04 shall include:

1. Workers' Compensation and Employers' Liability Insurance. This insurance shall protect CONTRACTOR against all claims under applicable state workers' compensation laws, including coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. CONTRACTOR shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of workers' compensation laws. This policy shall include an "all states" or "other states" endorsement. The liability limits shall be not less than:

Workers' Compensation: Statutory

Employers' liability: \$1,000,000 each occurrence

2. Commercial Automobile Liability Insurance. This insurance shall be occurrence type written in comprehensive form and shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the Project Site, whether they are owned, non-owned, or hired.

The liability limits shall be not less than: \$2,000,000

3. Commercial General Liability Insurance. This insurance shall be occurrence type written in comprehensive form acceptable to CITY. This insurance shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include coverage for personal injury liability; contractual liability; completed operations and products liability; and for blasting, explosion, and collapse of buildings; and damage to underground property. The liability limits for bodily injury and property damage shall be not less than:

\$2,000,000 combined single limit for each occurrence

\$2,000,000 general aggregate.

4. The insurer's costs of providing the insureds a defense and appeal as additional insureds, including attorney's fees, shall be supplementary and shall not be included as part of the policy limits but shall remain the insurer's separate responsibility.

5.05 CITY's Liability Insurance

A. In addition to the insurance required to be provided by CONTRACTOR under Paragraph 5.04, CITY, at CITY's option, may purchase and maintain at CITY's expense liability insurance

that will protect CITY against claims which may arise from operations under the Contract Documents.

5.06 Property Insurance

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance on the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws or Regulations). This insurance shall:

1. include the interests of CITY, CONTRACTOR, Subcontractors, and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, tornado, collapse, debris removal, demolition occasioned by enforcement of Laws or Regulations, water damage, damage caused by frost and freezing, and acts of God;
3. be maintained in effect until final payment is made unless otherwise agreed to in writing by CITY with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. CITY shall not be responsible for purchasing and maintaining any property insurance to protect the interests of CONTRACTOR, Subcontractors or others involved in the Work to the extent of any deductible amounts. The risk of loss within the deductible amounts will be borne by CONTRACTOR, Subcontractor or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 Waiver of Rights

A. CITY and CONTRACTOR intend that all policies purchased in accordance with Paragraphs 5.04 and 5.06 will protect CITY, CONTRACTOR, DESIGN PROFESSIONAL Consultants, Subcontractors, and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. CITY and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work, but only to the extent of insurance coverage; and, in addition, waive all such rights against DESIGN PROFESSIONAL, Consultants, Subcontractors, and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of any and each of them) under such policies for losses and damages so caused and covered by insurance. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by CITY as trustee or otherwise payable under any policy so issued. None of the above waivers shall apply if specifically in conflict with Laws and Regulations.

5.08 Receipt and Application of Insurance Proceeds

A. Any insured loss under the property insurance will be adjusted with CITY and made payable to CITY as fiduciary for the insureds, as their interests may appear, subject to the requirements of any indentures of indebtedness entered into by CITY.

B. CITY as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object to CITY's exercise of this power in writing within fifteen (15) days after the occurrence of loss. If such objection is made, CITY as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, CITY as fiduciary shall adjust and settle the loss with the insurers.

5.09 Partial Utilization – Property Insurance

A. If CITY finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with Paragraph 14.05; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.01 Indemnification

A. For purposes of this Paragraph 6.01 only, the following terms shall have the meanings listed:

1. Claims means all claims, damages, liability, losses, costs and expenses, including court costs and reasonable attorneys' fees, including attorney's fees incurred by the City in the enforcement of this indemnity obligation.

2. CONTRACTOR'S Agents means CONTRACTOR's officers, employees, sub-consultants, subcontractors, successors, assigns, invitees, and other agents.

3. CITY means CITY, its Program Manager/Construction Advisor and any of their agents, officials, officers, employees and program managers or construction advisors.

B. CONTRACTOR's obligations under this Paragraph with respect to indemnification for acts or omissions, including negligence, of CITY, shall be limited to the coverage and limits of insurance that CONTRACTOR is required to procure and maintain under this Contract. CONTRACTOR affirms that it has had the opportunity to recover the costs of the liability insurance required in this Contract in its contract price.

C. CONTRACTOR shall defend, indemnify and hold harmless CITY from and against all Claims arising out of or resulting from all acts or omissions in connection with this Contract caused in whole or in part by CONTRACTOR or CONTRACTOR's Agents, regardless of whether or not caused in part by any act or omission, including negligence, of OWNER.

D. In any and all Claims against CITY, DESIGN PROFESSIONAL, CONSULTANT, or any of their respective agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.01 C shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

E. The indemnification obligations of CONTRACTOR under Paragraph 6.01 C shall not extend to liability arising out of, resulting from, or caused by the professional negligence, errors or omissions of DESIGN PROFESSIONAL, CONSULTANT, or any of their respective agents, officers, directors or employees.

6.02 Supervision and Superintendence

A. CONTRACTOR shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent of the Work, who shall not be replaced without written request to and approval by CITY except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

C. If it is determined to be in the best interest of the Work, CONTRACTOR shall replace the project manager, resident superintendent or any other employee of the CONTRACTOR, Subcontractors, Suppliers or other persons or organizations performing or furnishing any of the Work on the project upon written request by the CITY.

6.03 Services, Working Hours, Labor, Materials and Equipment

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out and construct or perform the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the Site shall be performed during regular working hours. CONTRACTOR shall not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without CITY's written consent given after prior written notice to DESIGN PROFESSIONAL.

B. Unless otherwise specified in Division 1, General Requirements, CONTRACTOR shall furnish and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

C. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of CITY. If required by DESIGN PROFESSIONAL, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

D. It is the policy of the CITY that any manufactured goods or commodities used or supplied in the performance of this Contract and any subcontract hereto shall be manufactured or produced in the United States whenever possible.

6.04 Progress Schedule

A. CONTRACTOR shall adhere to the progress schedule established in accordance with Article 2 as it may be adjusted from time to time as provided below:

1. CONTRACTOR shall provide, at least once every thirty (30) calendar days, updated information on the project schedule, including thirty (30) day look ahead schedules, projected variances per event category and per Subcontractor, identification of all variances and calculation of the number of Days difference between the as-built critical path and the project schedule critical path

2. CONTRACTOR shall, with each application for payment, provide completed monthly updated status report for the previous month on the project schedule and updated information indicating as-built and as-planned conditions. The updated information on the project schedule shall not modify any Milestone dates in the project schedule that CITY has previously approved. The updated information required is a condition precedent to payment pursuant to paragraph 14.02 and shall include at a minimum:

- a. a concise statement of the outlook for meeting project schedule dates and the reasons for any change in outlook from the previous report;
- b. a review of any significant technical problems encountered during the month;
- c. an explanation of any corrective action taken or proposed; and
- d. a summary of any Claims anticipated by CONTRACTOR with respect to the Work, including the anticipated costs and schedule impacts of any such Claims.

6.05 Recovery Schedules

A. If the CONTRACTOR should:

1. fail, refuse or neglect to supply a sufficient number of workers or to deliver the materials or equipment with such promptness as to prevent the delay in the progress of the Work;
2. fail in any respect to commence and diligently prosecute the Work in accordance with the approved baseline project schedule in order to achieve substantial completion;
3. fail to commence, prosecute, finish, deliver or install the different portions of the Work on time as specified in the approved baseline project schedule; or
4. fail in the performance of any of the material covenants of the Contract Documents;

CITY shall have the right to direct the CONTRACTOR, upon seven (7) calendar days notice, to prepare a written recovery plan, for CITY's approval, to accelerate the Work in order to conform to the approved baseline project schedule, including, without limitation, providing additional labor or expediting delivery of materials, performing overtime or re-sequencing the Work without adjustments to the Contract value. Upon CITY's approval of the recovery plan, CONTRACTOR shall accelerate the Work in accordance with the plan.

B. Proposed recovery schedules shall be submitted to the CITY as a separate project plan for review and approval by CITY prior to incorporation into the approved baseline schedule. The recovery schedule shall be submitted in a format compatible with the baseline schedule format. Each proposed revision shall be submitted as a separate schedule, with the following minimum requirements:

1. A critical path method diagram showing revised and affected activities or Milestones.
2. An activity report for all revised and affected activities or Milestones.

C. Upon acceptance of the recovery schedule by CITY, data shall be added or revised for all new or revised activities and incorporated into the approved baseline project schedule.

6.06 Substitutes and “Or-Equal” Items

A. Materials or equipment: Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance and quality required. Unless the specification or description contains, or is followed by, words reading that no like, equivalent or “or-equal” item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to CITY for review by CITY’s Representative under the following circumstances:

1. “Or-Equal”: If, prior to receipt of Bids, Bidder proposes an item of material or equipment as functionally equal to that named and sufficiently similar so that no change in related Work will be required, CITY’s Representative may request DESIGN PROFESSIONAL to consider it as an “or-equal” item. DESIGN PROFESSIONAL will review and recommend the acceptance, or rejection, of the proposed item to the CITY’s Representative. For the purposes of this Paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment DESIGN PROFESSIONAL determines that:

(1) it is at least equal in quality, durability, appearance, strength, and design characteristics; and

(2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; and

b. Bidder certifies that:

(1) there is no increase in cost to the CITY; and

(2) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

If the CITY’s Representative approves the proposed item, it may be accepted by CITY.

2. Substitute Items: If CONTRACTOR proposes an item of material or equipment as a substitute item, then CONTRACTOR shall submit sufficient information as provided below to allow CITY’s Representative to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the CITY’s Representative will include the following as supplemented in the General Requirements and as CITY’s Representative may determine is appropriate under the circumstances:

a. Requests for review of proposed substitute items of material or equipment will not be accepted by CITY’s Representative from anyone other than CONTRACTOR.

b. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall first make written application to CITY’s Representative for acceptance thereof.

c. In the application, CONTRACTOR shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will impact CONTRACTOR’s achievement of Substantial Completion, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with CITY for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

d. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by CITY's Representative in evaluating the proposed substitute. CITY's Representative may require CONTRACTOR to furnish additional data about the proposed substitute.

If the CITY's Representative approves the proposed item, CITY may accept it.

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to DESIGN PROFESSIONAL. CONTRACTOR shall notify CITY and submit sufficient information to allow DESIGN PROFESSIONAL, in DESIGN PROFESSIONAL's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents.

C. Expenses: Bidder shall provide all data in support of any "or equal" at Bidder's expense, and CONTRACTOR shall provide all data in support of any proposed substitute at CONTRACTOR's expense.

D. Evaluation: DESIGN PROFESSIONAL and CITY's Representative will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.06 A, and 6.06 B. CITY will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without CITY's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. CITY may require CONTRACTOR to furnish at CONTRACTOR's expense, a special performance guarantee or other surety with respect to any "or-equal" substitute. DESIGN PROFESSIONAL will record time required by DESIGN PROFESSIONAL and Consultants in evaluating substitutes proposed or submitted by CONTRACTOR pursuant to Paragraphs 6.06 A and 6.06 B and in making changes in the Contract Documents (or in the provisions of any other direct contract with CITY for work on the Project) occasioned thereby. Whether or not CITY accepts a substitute so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse CITY for the reasonable charges of DESIGN PROFESSIONAL and Consultants for evaluating each such proposed substitute.

6.07 Concerning Subcontractors, Suppliers and Others

A. CONTRACTOR shall not employ or retain any Subcontractor, Supplier or other person or organization (including those acceptable to CITY as indicated in Paragraph 6.07 B), whether initially or as a substitute, against whom CITY has a reasonable objection, including but not limited to debarment by City or another governmental entity or decertification of the Subcontractor from the City's Minority and Women's Business Enterprise Program as a result of the Subcontractor's failure to comply with any of the requirements of the provisions of Chapter 3 of the City's Code as determined by the Director of the Civil Rights and Equal Opportunity Department. Contractor shall insert this provision in any subcontractor agreement associated with this Contract. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection. CONTRACTOR shall submit required information for all Subcontractors on Form 01290.09 - Subcontractor and Major Material Suppliers List, provided in these Contract Documents, prior to Subcontractor beginning Work at the Site.

B. The Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) to be submitted to CITY on or before the date specified in the Supplementary Conditions, for acceptance by CITY. If CONTRACTOR has submitted a list

thereof in accordance with the Supplementary Conditions, CITY may accept (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Contract Documents) any such Subcontractor, Supplier or other person or organization so identified, or may reject same on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier or other person or organization. The Contract Price will be adjusted by the difference in the cost occasioned by such substitution, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by CITY of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of CITY or DESIGN PROFESSIONAL to reject defective Work.

C. CONTRACTOR shall be fully responsible to CITY for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between CITY or DESIGN PROFESSIONAL and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of CITY or DESIGN PROFESSIONAL to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws or Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall contractually require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with CITY and DESIGN PROFESSIONAL through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier shall be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor or Supplier that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of CITY. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against CITY, CONTRACTOR, DESIGN PROFESSIONAL, Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any perils, to the extent covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

H. Except as otherwise provided in this subsection H and in accordance with the provisions of subsection C hereof, the agreement between CONTRACTOR and the Subcontractor or Supplier referred to in subsection G, shall provide that the CONTRACTOR and the Subcontractor or Supplier agree not to request CITY or CITY's Representative to intervene in or facilitate the resolution of claims or contract disputes arising out of or related to the agreement between CONTRACTOR and the Subcontractor or Supplier. Furthermore, the Contracts between CONTRACTOR and Subcontractors or Suppliers shall provide that all unresolved claims and disputes between CONTRACTOR and the Subcontractor or Supplier that remain unresolved after thirty (30) calendar days from the notice of claim, shall be subject to mediation as a condition precedent to the institution of legal proceedings by either party. Any such mediation shall be conducted in accordance with the CITY's Code Section 3-467.

I. CONTRACTOR shall not insert any provision in any subcontractor agreement associated with this Contract that explicitly states or implies that the subcontractor shall only be paid for work performed if or when the general CONTRACTOR is paid by the CITY . Contractor's compliance with this provision is a material term of this Contract.

J. CONTRACTORS shall not deny any Subcontractor subcontracting opportunities solely because the Subcontractor is not a signatory to collective bargaining agreements with organized labor.

6.08 Patent Fees and Royalties

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation into the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work, and if to the actual knowledge of CITY or DESIGN PROFESSIONAL its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by CITY in the Contract Documents. To the fullest extent permitted by Laws or Regulations, CONTRACTOR shall defend, indemnify and hold harmless CITY, DESIGN PROFESSIONAL, Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation into the Work of any invention, design, process, product or device not specified in the Contract Documents.

6.09 Permits

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. CITY shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Contract. CONTRACTOR shall pay all charges of utility owners for connections to the Work.

B. CONTRACTOR, at its own expense, shall comply with all Federal, State and local laws and regulations, including, but not limited to the Missouri Clean Water Law (Chapter 644 RSMo) together with any accompanying regulation(s) contained in the Missouri Code of State Regulations (CSR Title 10), as well as any implementing permits, together with any CITY Provisions during the life of this Contract including but not limited to:

1. Approvals and permits as required for construction or land disturbance activities.
2. Compliance with the State of Missouri – Department of Natural Resources (“MDNR”) Missouri State Operating Permit (“Land Disturbance Permit”), MO-R100006 for all construction or land disturbance activity.
3. Development and implementation of a Storm Water Pollution Prevention Plan (SWPPP).
 - (a) Contractor shall not commence land disturbance activity until the initial SWPPP has been finalized.
 - (b) Preparation and submittal of all applications, documentation and exhibits required to obtain MDNR approvals for uninterrupted Work at the Site.
 - (c) Amending/Updating SWPPP.
 - (d) Site Inspections and submittal of Inspection Reports

(e) Proper Operation and Maintenance to achieve compliance with the terms of the Permit.

(f) Maintenance of required records in accordance with MDNR requirements and requirements included in Article 6 of these Contract Documents.

4. In addition to requirements of Article 6, Contractor shall also provide record access to Missouri Department of Natural Resources (MDNR).

5. Failure to control erosion and water pollution is a permit violation. CONTRACTOR shall have 24 hours after receiving notice of the violation to correct the problem. If the CONTRACTOR fails to correct the problem after the time prescribed, the City will hire a remediation expert to fix the problem. In such an event, the CONTRACTOR shall be liable to the City for the remediation costs plus a 10% mark-up of the total contract price. If the CONTRACTOR receives three (3) notices of violation of the erosion control plan and the City's MS4 permit, the Director may issue a stop work order and delay any payment until control measures are properly functioning and stream damage has been mitigated. In such an event, any delay to the project schedule will result in liquidated damages assessed against the CONTRACTOR.

6.10 Compliance with Laws and Regulations

A. CONTRACTOR shall comply with all federal, state and local laws, ordinances and regulations applicable to the work and this Contract. CONTRACTOR shall give all notices and comply with all Laws or Regulations applicable to furnishing and performing the Work. Except where otherwise expressly required by applicable Laws or Regulations, neither CITY nor DESIGN PROFESSIONAL shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations. The Laws or Regulations included in this Paragraph shall include, but not be limited to, those set forth in the Supplementary Conditions.

B. Failure to Comply. If CONTRACTOR performs any Work in violation of applicable Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting therefrom; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws or Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under Paragraph 3.03.

C. Conflicts of Interest. The provisions of City's Code Sections 2-2001 and 3-301, prohibiting City officers and employees from having a financial or personal interest in any contract with City, and Code Sections 3-307, and 3-309, imposing sanctions for violations, shall apply to this Contract. CONTRACTOR certifies that no officer or employee of City has, or will have, a direct or indirect financial or personal interest in this Contract, and that no officer or employee of City, or member of such officer's or employee's immediate family, either has negotiated, or has or will have an arrangement concerning employment to perform services on behalf of CONTRACTOR on this Contract.

D. Licenses and Permits. CONTRACTOR, at its own expense, shall secure or cause to be secured all licenses and permits from public or private sources necessary for the fulfillment of its obligations under this Contract. All references in this Contract to the "Code" shall mean City's Code of Ordinances, including any amendments thereto or re-codification thereof unless the context clearly indicates otherwise. CONTRACTOR shall obtain copies of all necessary licenses and permits from Subcontractors required for the Work before Subcontractors begin Work at the Site. CONTRACTOR shall retain such evidence in its files and make available to CITY within ten (10) days after CITY's written request.

E. Americans with Disabilities Act. CONTRACTOR agrees to comply, during the course of this Contract, with all provisions of Title II of the 2010 ADA Standards for Accessible Design as amended from time to time.

F. Affirmative Action. If the Contract Price exceeds \$300,000.00 and CONTRACTOR employs fifty (50) or more people, CONTRACTOR shall comply with City's Affirmative Action requirements in accordance with the provisions of Chapter 3 of City's Code, the rules and regulations relating to those sections, and any additions or amendments thereto. CONTRACTOR shall not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 3 of City's Code.

CONTRACTOR shall:

1. Submit, in print or electronic format, a copy of CONTRACTOR'S current certificate of compliance to the City's Civil Rights and Equal Opportunity Department (CREO) prior to receiving the first payment under the contract, unless a copy has already been submitted to CREO at any point within the previous two calendar years. If, and only if, CONTRACTOR does not possess a current certification of compliance, CONTRACTOR shall submit, in print or electronic format, a copy of its affirmative action program to CREO prior to receiving the first payment under the contract, unless a copy has already been submitted to CREO at any point within the previous two calendar years.

2. Require any Subcontractor awarded a subcontract exceeding \$300,000.00 to affirm that Subcontractor has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the subcontract.

3. Obtain from any Subcontractor awarded a subcontract exceeding \$300,000.00 a copy of the Subcontractor's current certificate of compliance and tender a copy of the same, in print or electronic format, to CREO within thirty (30) days from the date the subcontract is executed. If, and only if, Subcontractor does not possess a current certificate of compliance, CONTRACTOR shall obtain a copy of the Subcontractor's affirmative action program and tender a copy of the same, in print or electronic format, to CREO within thirty (30) days from the date the subcontract is executed.

City has the right to take action as directed by City's Civil Rights and Equal Opportunity Department to enforce this provision. If CONTRACTOR fails, refuses or neglects to comply with the provisions of Chapter 3 of City's Code, then such failure shall be deemed a total breach of this Contract and this Contract may be terminated, canceled or suspended, in whole or in part, and CONTRACTOR may be declared ineligible for any further contracts funded by City for a period of one (1) year. This is a material term of this Contract.

G. Minority and Women Business Enterprises and Workforce. City is committed to ensuring that minorities and women participate to the maximum extent possible in the performance of City's construction contracts. If minority and women business enterprise (M/WBE) goals have been set for this Contract, CONTRACTOR agrees to comply with all requirements of City's Minority and Women's Business Enterprise Program as enacted in City's Code, Sections 3-421 through 3-469 and as hereinafter amended. CONTRACTOR shall meet or exceed both the MBE and WBE goals set forth in its Contractor Utilization Plan/Request for Waiver. If workforce utilization goals are applicable to this Contract, CONTRACTOR agrees to comply with all requirements of City's Construction Employment Program as enacted in City's Code, Sections 3-501 through 3-527 and as hereinafter amended. CONTRACTOR shall meet or exceed the construction employment goals unless the same shall have been waived in the manner provided by law. CONTRACTOR's compliance with this provision is a material part of this Contract.

H. Records.

1. For purposes of this section:

(a) "City" shall mean the City Auditor, the City's Internal Auditor, the City's Director of Civil Rights and Equal Opportunity, the City Manager, the City department administering this Contract and their delegates and agents.

(b) "Record" shall mean any document, book, paper, photograph, map, sound recordings or other material, regardless of physical form or characteristics, made or received in connection with this Contract and all Contract amendments and renewals.

2. CONTRACTOR shall maintain and retain all Records for a term of five (5) years that shall begin after the expiration or termination of this Contract and all Contract amendments. City shall have a right to examine or audit all Records and CONTRACTOR shall provide access to City of all records upon ten (10) days written notice from the City.

I. Prevailing Wage.

1. CONTRACTOR shall comply and require its Subcontractors to comply with;

a. sections 290.210 to 290.340, RSMO the State of Missouri Prevailing Wage Law (the "Law"); and

b. 8 CSR 30-3.010 to 8 CSR 30-3.060, the Prevailing Wage Law Rules (the "Rules"); and

c. the Annual Wage Order (Wage Order) issued by the State of Missouri's Department of Labor and Industrial Relations; and

d. any applicable Annual Incremental Wage Increase (Wage Increase) to the Annual Wage Order.

2. The Law, Rules, Annual Wage Order and any Wage Increase are incorporated into and made part hereof this Contract and shall be collectively referred to in this Section as the "Prevailing Wage Requirements."

3. CONTRACTOR shall pay and require its Subcontractors to pay to all workers performing work under this Contract not less than the prevailing hourly rate of wages for the class or type of work performed by the worker in accordance with the Law, Rules, Wage Order and any applicable Wage Increase. CONTRACTOR shall take whatever steps are necessary to insure that the prevailing hourly wage rates are paid and that all workers for CONTRACTOR and each of its Subcontractors are paid for the class or type of work performed by the worker in accordance with the Prevailing Wage Requirements. If CONTRACTOR shall fail to start to perform CONTRACTOR's obligations under the Contract Documents within sixty (60) days from the Effective Date of the Contract, CONTRACTOR and each of its subcontractors shall be obligated to pay all workers in accordance with any new Wage Order, as subsequently amended by any applicable Wage Increase, issued by the Department of Labor and Industrial Relations within the aforementioned sixty (60) day period. The new Wage Order and any applicable Wage Increase shall govern notwithstanding the fact that the Wage Order being replaced might be physically attached or incorporated in the Contract Documents.

4. Prior to each of its Subcontractors beginning Work on the Site, CONTRACTOR shall require each Subcontractor to complete CITY's Form 00490 entitled "Pre-contract Certification" that sets forth the Subcontractor's prevailing wage and tax compliance history for the two (2) years prior to the bid. CONTRACTOR shall retain one (1) year and make the Pre-contract Certifications available to CITY within five (5) days after written request.

5. CONTRACTOR shall:

a. Keep and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to keep full and accurate records on City's "Daily Labor Force Report" Form indicating the worker's name, occupational title or classification group & skill and the workers' hours. City shall furnish blank copies of the Daily Labor Force Report Form to Contractor for its use and for distribution to Subcontractors. Contractor shall submit its and its Subcontractors Daily Labor Force Reports to City each day; and

b. Submit, and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to submit electronically, in a format prescribed by the City, Certified Payroll Report Information indicating the worker's name, address, social security number, occupation(s), craft(s) of every worker employed in connection with the public work together with the number of hours worked by each worker and the actual wages paid in connection with the Project and other pertinent information as requested by the City; and

c. Submit, and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to submit, electronically, in format prescribed by the City, a Payroll Certification. The Payroll Certification must be signed by the employee or agent who pays or supervises the payment of the workers employed under the Contract for the Contractor and each Subcontractor; and

d. The Daily Labor Force Report, documents used to compile information for the Certified Payroll Report, and Payroll Certification are collectively referred to in this Section as the "Records."

6. CONTRACTOR shall submit its and its Subcontractors Daily Labor Force Reports to CITY each day. CONTRACTOR shall make all of CONTRACTOR's and Subcontractors' Records open to inspection by any authorized representatives of OWNER and the Missouri Department of Labor and Industrial Relations at any reasonable time and as often as they may be necessary and such Records shall not be destroyed or removed from the State of Missouri for a period of one (1) year following the completion of the public work in connection with which the Records are made. CONTRACTOR shall have its and its Subcontractors Certified Payroll Reports and Payroll Certifications available at the CONTRACTOR's office and shall provide the Records to the City electronically at City's sole discretion. In addition, all Records shall be considered a public record and CONTRACTOR shall provide the Records to the CITY in the format required by the CITY within three (3) working days of any request by CITY at the CONTRACTOR's cost. CITY, in its sole discretion, may require CONTRACTOR to send any of the Records directly to the person who requested the Record at CONTRACTOR's expense.

7. CONTRACTOR shall post and keep posted a clearly legible statement of all prevailing hourly wage rates to be paid to all workers employed by CONTRACTOR and each of its Subcontractors in the performance of this Contract in a prominent and easily accessible place at the Site of the Work by all workers.

8. If the Contract Price exceeds \$250,000.00, CONTRACTOR shall and shall require each Subcontractor engaged in any construction of public works to have its name, acceptable abbreviation or recognizable logo and the name of the city and state of the mailing address of the principal office of the company, on each motor vehicle and motorized self-propelled piece of equipment which is used in connection with the Project during the time the CONTRACTOR or Subcontractor is engaged on the project. The sign shall be legible from a distance of twenty (20') feet, but the size of the lettering need not be larger than two (2") inches. In cases where equipment is leased or where affixing a legible sign to the equipment is impractical, the CONTRACTOR may place a temporary stationary sign, with the information required pursuant to this section, at the main entrance of the Project in place of affixing the required information on the equipment so long as such sign is not in violation of any state or federal statute, rule or regulation. Motor vehicles which are required to have similar information affixed thereto pursuant to requirements of a regulatory agency of the state or federal government are exempt from the provisions of this subsection.

9. CONTRACTOR must correct any errors in CONTRACTOR's or any Subcontractors' Records, or CONTRACTOR's or any Subcontractors' violations of the Law, Rules, Annual Wage Order and any Wage Increase within fourteen (14) calendar days after notice from CITY.

10. CONTRACTOR shall and shall require its Subcontractors to cooperate with the CITY and the Department of Labor and Industrial Relations in the enforcement of this Section, the Law, Rules, Annual Wage Order and any Wage Increase. Contractor shall and shall require its Subcontractors to permit CITY and the Department of Labor and Industrial Relations to interview any and all workers during working hours on the Project at CONTRACTOR's sole cost and expense.

11. CONTRACTOR shall file with CITY, upon completion of the Project and prior to final payment therefore, affidavits from CONTRACTOR and each of its Subcontractors, stating that each has fully complied with the provisions and requirements of the Missouri Prevailing Wage Law. CITY shall not make final payment until the affidavits, in proper form and order, from CONTRACTOR and each of its Subcontractors, are filed by CONTRACTOR.

12. CONTRACTOR shall forfeit as a statutory penalty to the CITY one hundred dollars (\$100.00) for each worker employed, for each calendar day, or portion thereof, such worker is paid less than the prevailing hourly rates for any work done under this Contract, by CONTRACTOR or by any of CONTRACTOR's Subcontractors. If CONTRACTOR or any of its Subcontractors have violated any section(s) of 290.210 to 290.340, RSMo, in the course of the execution of the Contract, CITY shall when making payments to the CONTRACTOR becoming due under this Contract, withhold and retain therefrom all sums and amounts due and owing as a result of any violation of sections 290.210 to 290.340, RSMo.

J. Prevailing Wage Damages. CONTRACTOR acknowledges and agrees that, based on the experience of CITY, violations of the Missouri Prevailing Wage Act, whether by CONTRACTOR or its Subcontractors, commonly result in additional costs to CITY. CONTRACTOR agrees that additional costs to CITY for any particular violation are difficult to establish and include but are not limited to: costs of construction delays, additional work for CITY, additional interest expenses, investigations, and the cost of establishing and maintaining a special division working under the City Manager to monitor prevailing wage compliance.

1. In the event of the failure by CONTRACTOR or any of its Subcontractors to pay wages as provided in the Missouri Prevailing Wage Act, CITY shall be entitled to deduct from the Contract Price, and shall retain as liquidated damages, one hundred dollars (\$100.00) per day, per worker who is paid less than the prevailing hourly rate of wages, to approximate the additional costs. The sum shall be deducted, paid or owed whether or not the Contract Times have expired.

2. CITY shall give written notice to CONTRACTOR setting forth the workers, who have been underpaid, the amount of the statutory penalty and the amount of the liquidated damages as provided for in this Subparagraph J. CONTRACTOR shall have fourteen (14) calendar days to respond, which time may be extended by CITY upon written request. If CONTRACTOR fails to respond within the specified time, the CITY's original notice shall be deemed final. If CONTRACTOR responds to CITY's notice, CITY will furnish CONTRACTOR a final decision in writing within five (5) days of completing any investigation.

K. Missouri Secretary of State Business Entity Registration. CONTRACTOR shall obtain from all Subcontractors for the Project, a copy of their current certificate of good standing or fictitious name registration from the Missouri Secretary of State before they begin work on the Site. CONTRACTOR shall retain such documents in its files and make available to CITY within ten (10) days after written request.

L. Tropical Hardwoods. The provisions of Code Section 2-1872, restricting the use of tropical hardwoods, shall apply to this Contract.

M. Preference for Missouri Products. Pursuant to Section 71.140 RSMo., preference shall be given to materials, products, supplies and all other articles produced, manufactured, made or grown within the State of Missouri.

N. Guidelines for Open Excavations.

1. CONTRACTOR shall restore required excavations to the level of the adjacent surfaces as soon as practicable. Unsupervised open excavations on public properties are discouraged at all times. If CONTRACTOR, in performance of the Work, makes or causes to be made any excavation in, upon, under, through or adjoining any street, sidewalk, alley, park, boulevard, parkway or any other public properties, and shall leave any part or portion thereof open, CONTRACTOR shall provide effective protection to the public.

2. CONTRACTOR shall protect and secure all excavations in roadways in compliance with existing federal, state and local codes and standards, including, but not limited to the most current edition of the Manual of Uniform Traffic Control Devices. CONTRACTOR shall protect and secure all unsupervised excavations not within roadways, either by covering or fencing.

a. Covering. A protective cover that can sustain the weight of persons or of objects that are placed upon it may be installed over an unsupervised excavation. The cover shall be secured to the ground to prevent movement. Protective covers shall have no opening(s) or protuberance(s) of sufficient size to cause a fall and/or injury. Advance warning devices shall be installed as necessary.

b. Fencing. Fencing to prevent entry may be installed surrounding an unsupervised excavation not protectively covered in its entirety. The fencing shall be a minimum of 42" in height. The fencing shall be constructed in such a manner that it is adequately secured and will remain upright at all times under normal Site conditions. All protective coverings and fences over and around excavations shall be inspected at least daily to assure integrity. Protective coverings and/or fences in heavily trafficked areas shall be inspected more often as necessary.

O. Notification of Utilities. CONTRACTOR shall adhere to the provisions of Sections 319.010 et seq., RSMo., which requires that a person or firm making an excavation in any public street, road or alley, right of way dedicated to public use, utility easement of record, or within any private street or private property do so only after giving notice to, and obtaining information from, owners of Underground Facilities. The 24-hour, toll-free accident prevention hotline number in Missouri is 1-800-344-7483 (1-800-Digrite).

P. Employee Eligibility Verification. CONTRACTOR shall adhere to the provisions of Sections 285.525 et seq., RSMo., which requires that for any contract exceeding five thousand dollars (\$5,000.00), CONTRACTOR shall execute and submit an affidavit, in a form prescribed by CITY, affirming that CONTRACTOR does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. § 1324a(h)(3). CONTRACTOR shall attach to the affidavit documentation sufficient to establish CONTRACTOR'S enrollment and participation in an electronic verification of work program operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and Control Act of 1986. CONTRACTOR may obtain additional information about E-Verify and enroll at <https://e-verify.uscis.gov/enroll/StartPage.aspx?JS=YES>. For those Contractors enrolled in E-Verify, the first and last pages of the E-Verify Memorandum of Understanding that CONTRACTOR will obtain upon successfully enrolling in the program shall constitute sufficient documentation for purposes of complying with this Section. CONTRACTOR shall submit the affidavit and attachments to CITY prior to execution of the Contract, or at any point during the term of the Contract if requested by City.

Q. OSHA 10-Hour Training Requirement. CONTRACTOR and any subcontractor working under this Contract shall require every employee on the Site to complete a ten-hour construction safety program which meets the requirements of Section 292.675, RSMo, except for those employees who shall have previously completed the required program and hold documentation to that effect. CONTRACTOR shall remove or require the removal of any

person from the Site who is subject to this requirement and who does not complete or is unable to produce documentation of their successful completion of the required program within the time limitations prescribed by Section 292.675, RSMo. CONTRACTOR shall forfeit the sum of two thousand five hundred dollars (\$2,500.00), in addition to one hundred dollars (\$100.00) per employee each calendar day, or portion thereof, the employee(s) shall continue to be employed without having completed the required program within the time limitations prescribed by Section 292.675, RSMo. CITY shall be entitled to withhold and retain any amounts due and owing hereunder when making payment to CONTRACTOR.

R. Clean Air Act and Clean Water Act. CONTRACTOR shall comply with requirements of the Clean Air Act (42 U.S.C. 7401 *et seq.*); Clean Water Act (33 U.S.C. 1251 *et seq.*), Missouri Clean Water Law (Chapter 644 RSMo), Code of Federal regulations (Title 40: Protection of Environment, Title 33: Navigation and Navigable Waters) and the rules of the Missouri Code of State Regulations (CSR Title 10).

S. Contract information Management System. If applicable, CONTRACTOR shall comply with CITY's Contract Information Management System requirements. CONTRACTOR shall use CITY's Internet web based Contract Information Management System/Project Management Communications Tool provided by CITY and protocols included in that software during the term of this Contract. CONTRACTOR shall maintain user applications to CITY's provided system for all personnel, subcontractors or suppliers as applicable and shall require subcontractors/subconsultants to maintain same.

T. Anti-Discrimination Against Israel. If this Contract exceeds \$100,000.00 and CONTRACTOR employs at least ten employees, pursuant to Section 34.600, RSMo., by executing this Contract, CONTRACTOR certifies it is not currently engaged in and shall not, for the duration of this contract, engage in a boycott of goods or services from the State of Israel; companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel; or persons or entities doing business in the State of Israel.

U. Ban the Box in Hiring and Promotion

- a. Pursuant to Section 38-104, City Code Ordinances, CONTRACTOR shall not base a hiring or promotional decision on an applicant's criminal history or sentence related thereto, unless the employer can demonstrate that the employment-related decision was based on all information available including consideration of the frequency, recency and severity of a criminal record and that the record was reasonably related to the duties and responsibilities of the position.
- b. Notwithstanding subsection (a), CONTRACTOR may inquire about an applicant's criminal history after it has been determined that the individual is otherwise qualified for the position, and only after the applicant has been interviewed for the position. Any such inquiry may be made of all applicants who are within the final selection pool of candidates from which a job will be filled.
- c. This provision shall not apply to positions where employers are required to exclude applicants with certain criminal convictions from employment due to local, state or federal law or regulation.

V. Title VI of the Civil Rights Act of 1964

- a. Title VI of the Civil Rights Act of 1964 requires that no person in the United States shall, on the grounds of race, color, or national or origin (including limited English proficient individuals), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. The City of Kansas City, Missouri requires compliance with the requirements of Title VI in all of its programs and activities regardless of the funding source.

- b. CONTRACTOR shall not discriminate on the grounds of race, color, or national or origin (including limited English proficient individuals).

W. Non-discrimination in Employment

CONTRACTOR shall not discriminate against any employee or candidate for employment on the basis of an individual's race, hair texture or hair style associated with an individual's race, color, sex, religion, national origin, or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 38 of the City Code. CONTRACTOR shall not engage in any discrimination as prohibited by Chapter 3 of the City Code.

X. Quality Services Assurance Act

If this Contract exceeds \$160,000.00, CONTRACTOR certifies that CONTRACTOR will pay all employees who will work on this Contract in the city limits of Kansas City, Missouri at least \$15.00 per hour in compliance with the City's Quality Services Assurance Act, Section 3-66, Code of Ordinances unless City has granted CONTRACTOR an exemption pursuant to the Quality Services Assurance Act.

6.11 Taxes

A. CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws or Regulations of the place of the Project which are applicable during the performance of the Work.

B. Tax Compliance.

1. As a condition precedent to CITY making its first payment to CONTRACTOR under this Contract, CONTRACTOR shall furnish to CITY sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year prior to the date provided to CITY, verifying that CONTRACTOR is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department.

2. As a condition precedent to Subcontractors performing any Work under this Contract, CONTRACTOR shall obtain from Subcontractor sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the date Subcontractor begins Work, verifying that the Subcontractor is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department. CONTRACTOR shall retain such documentation in its files and make available to CITY within ten (10) days after a written request.

3. As a condition precedent to CITY making final payment under this Contract, if this Contract is longer than one (1) year and exceeds the dollar threshold established by ordinance and included in the Supplementary Conditions, CONTRACTOR shall furnish to CITY sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the filing of a final Application for Payment, verifying that CONTRACTOR is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department.

4. If this Contract is longer than one (1) year and exceeds the dollar threshold established by ordinance and included in the Supplementary Conditions, CONTRACTOR shall obtain from Subcontractors sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the date of CONTRACTOR's final payment to the Subcontractor, that the Subcontractor was or is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department. CONTRACTOR shall retain such documentation in its files and make available to CITY within ten (10) days after written request.

5. If, at the time of final payment to CONTRACTOR, CONTRACTOR is unable to obtain from all its Subcontractors, if any, and furnish to CITY sufficient proof from City's Commissioner of Revenue that all its Subcontractors are in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department, CITY may approve final payment to CONTRACTOR if CITY determines that CONTRACTOR has made a good faith effort to furnish evidence or that there are other extenuating circumstances which make it impossible for CONTRACTOR to furnish sufficient proof.

C. Missouri Sales Tax Exemption. Pursuant to Section 144.062, RSMo, CITY is a Missouri exempt entity and tangible personal property to be incorporated or consumed in the construction of this Project may be purchased without sales tax. CITY shall furnish CONTRACTOR a Missouri Project Exemption Certificate for Sales Tax at the time of issuance of the Notice to Proceed.

6.12 Use of Site and Other Areas

A. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas identified in and permitted by the Contract Documents and other areas permitted by Laws or Regulations. CONTRACTOR shall not unreasonably encumber the Site and the other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to the Site or the other areas, or to the owner or occupant thereof, or of any adjacent land or areas, resulting from the performance of the Work.

B. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. In case of a failure on the part of the CONTRACTOR to restore such property or to make good such damage or injuries, the CITY may, upon forty-eight (48) hours written notice to the CONTRACTOR, repair, rebuild or otherwise restore such property as the CITY may deem necessary, and the cost thereof will be deducted from any moneys due or which may become due the CONTRACTOR under this Contract.

C. CONTRACTOR shall, to the fullest extent permitted by Laws or Regulations, defend, indemnify and hold harmless CITY, DESIGN PROFESSIONAL, Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against CITY, DESIGN PROFESSIONAL or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

D. During the progress of the Work, CONTRACTOR shall keep the Site and the other areas free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from Site and other areas as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the Site clean and ready for utilization or occupancy by CITY at Substantial Completion of the Work. CONTRACTOR shall restore to all property not designated for alteration by the Contract Documents to its pre-Work condition.

E. CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.13 Record Documents

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, the Contract, Written Amendments, Change Orders, Work

Change Directives, and written interpretations and clarifications in good order and annotated to show all changes made during construction. These record documents, together with all approved Samples and a counterpart of all approved Shop Drawings, will be available to CITY and DESIGN PROFESSIONAL for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered to DESIGN PROFESSIONAL for CITY.

6.14 Safety and Protection

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall comply with all applicable Laws or Regulations relating to the safety of persons or property to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for safety and protection. CONTRACTOR shall deliver to CITY a copy of CONTRACTOR'S Health and Safety Plan as provided in the Notice of Intent to Contract.

B. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in Paragraph 6.14 B.2 or 6.14 B.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of CITY, DESIGN PROFESSIONAL, Consultant, or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR, Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and DESIGN PROFESSIONAL has issued a notice to CONTRACTOR in accordance with Paragraph 14.07 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion). CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of the Work.

6.15 Safety Representative

A. In accordance with OSHA standards, CONTRACTOR shall designate a qualified and experienced safety representative whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs. CONTRACTOR's safety representative shall remain at the Site whenever there is Work in progress and shall immediately notify CITY of any emergencies or accidents occurring at the Site

6.16 Hazard Communication Programs

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.17 Emergencies

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR, without special instruction or authorization from CITY or DESIGN PROFESSIONAL, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give CITY and DESIGN PROFESSIONAL prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If CITY determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to an emergency, a Work Change Directive or Change Order will be issued.

B. A change in the Contract Documents pursuant to Paragraph 6.15 A will not be an automatic authorization of, nor a condition precedent to, entitlement to adjustment in the Contract Price or Contract Times. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price or Contract Times, a Claim may be made therefore as provided in Article 16. However, OWNER, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

6.18 Shop Drawings and Samples

A. CONTRACTOR shall submit Shop Drawings to DESIGN PROFESSIONAL for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see Paragraph 2.07). All submittals shall be identified as DESIGN PROFESSIONAL may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show DESIGN PROFESSIONAL the services, materials and equipment CONTRACTOR proposes to provide and to enable DESIGN PROFESSIONAL to review the information for the limited purposes required by Paragraph 6.18 D.

B. CONTRACTOR shall also submit Samples to DESIGN PROFESSIONAL for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample shall be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as DESIGN PROFESSIONAL may require to enable DESIGN PROFESSIONAL to review the submittal for the limited purposes required by Paragraph 6.18 D. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Submittal Procedures:

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submission, CONTRACTOR shall give DESIGN PROFESSIONAL specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, the notice to be in a written communication separate from the submittal, and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to DESIGN PROFESSIONAL for review and approval of each such variation.

D. DESIGN PROFESSIONAL's Review:

1. DESIGN PROFESSIONAL will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by DESIGN PROFESSIONAL as required by Paragraph 2.06. DESIGN PROFESSIONAL's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation into the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. DESIGN PROFESSIONAL's review and approval will not extend to means, methods, techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. DESIGN PROFESSIONAL's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called DESIGN PROFESSIONAL's attention to each such variation at the time of submission as required by Paragraph 6.18 C.3, and DESIGN PROFESSIONAL has given written approval of each such variation by specific written notation thereof incorporated into or accompanying the Shop Drawing or Sample approval; nor will any approval by DESIGN PROFESSIONAL relieve CONTRACTOR from responsibility for complying with the requirements of Paragraph 6.18 C.1.

E. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by DESIGN PROFESSIONAL as required by Paragraph 2.06, any related Work performed prior to DESIGN PROFESSIONAL's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

F. CONTRACTOR shall make corrections required by DESIGN PROFESSIONAL and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by DESIGN PROFESSIONAL on previous submittals.

6.19 Continuing the Work

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with CITY. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as CITY and CONTRACTOR may otherwise agree in writing.

6.20 CONTRACTOR's General Warranty and Guarantee

A. CONTRACTOR warrants and guarantees to CITY, DESIGN PROFESSIONAL and Consultants that all Work will be in accordance with the Contract Documents and will not be

defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers or any other individual or entity for whom CONTRACTOR is responsible; or
2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by DESIGN PROFESSIONAL;
2. recommendation of any progress or final payment by DESIGN PROFESSIONAL;
3. the issuance of a certificate of Substantial Completion or any payment related thereto by CITY to CONTRACTOR;
4. use or occupancy of the Work or any part thereof by OWNER;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by DESIGN PROFESSIONAL;
6. any inspection, test or approval by others; or
7. any correction of defective Work by CITY.

C. Nonconforming Work is rejected unless expressly accepted in writing by the CITY's Representative.

ARTICLE 7 OTHER WORK

7.01 Related Work at Site

A. CITY may perform other work related to the Project at the Site by CITY's own forces, or let other direct contracts therefore, or have other work performed by utility owners. If such other work is to be performed and such fact was not noted in the Contract Documents, then:

1. Written notice thereof will be given to CONTRACTOR prior to starting any such other work, and
2. CONTRACTOR may make a Claim therefore as provided in Article 16 if CONTRACTOR believes that such performance involves additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the amount or extent thereof.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract, and each utility owner (and CITY, if CITY is performing the additional work with CITY's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of CITY and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between CITY and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to CITY and DESIGN PROFESSIONAL in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable for the proper execution or results of CONTRACTOR's Work. CONTRACTOR's failure to report same will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work, except for latent or non-apparent defects and deficiencies in such other work.

7.02 Coordination

A. If CITY contracts with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, CITY shall have sole authority and responsibility in respect of such coordination.

ARTICLE 8 CITY'S RESPONSIBILITIES

8.01 Communications to CONTRACTOR

A. Except as otherwise provided in these General Conditions, CITY shall issue all communications to CONTRACTOR.

8.02 Replacement of DESIGN PROFESSIONAL

A. In case of termination of the employment of DESIGN PROFESSIONAL, CITY shall appoint a DESIGN PROFESSIONAL whose status under the Contract Documents shall be that of the former DESIGN PROFESSIONAL.

8.03 Furnish Data and Prompt Payment

A. CITY shall promptly furnish the data required of OWNER under the Contract Documents and shall make payments to CONTRACTOR when they are due.

8.04 Lands and Easements; Reports and Tests

A. CITY's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to CITY's duty to identify and make available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the Site and drawings of physical conditions in existing structures at or contiguous to the Site that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents.

8.05 Insurance

A. CITY's responsibilities, if any, for purchasing and maintaining liability and property insurance are set forth in Article 5 and the Supplementary Conditions.

8.06 Change Orders

A. CITY is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.07 Inspections, Tests and Approvals

A. CITY's responsibility for certain inspections, tests and approvals is set forth in Paragraph 13.02 F.

8.08 Limitations on CITY's Responsibilities

A. The CITY shall not supervise, direct or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws or Regulations applicable to the furnishing or performance of the Work. CITY will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

8.09 Undisclosed Hazardous Environmental Condition

A. CITY's responsibility for an undisclosed Hazardous Environmental Condition uncovered or revealed at the Site is set forth in Paragraph 4.06.

8.10 Evidence of Financial Arrangements

A. CITY will furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract.

8.11 CITY's Representative

A. CITY will provide a representative during the construction period. The duties, responsibilities and the limitations of authority of the CITY "'s Representative during construction are set forth in the Contract Documents.

8.12 Visits to Site

A. CITY's Representative will make visits to the Site at intervals appropriate to the various stages of construction as CITY's Representative deems necessary in order to observe the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, CITY's Representative will endeavor to determine, in general, if the Work is proceeding in accordance with the Contract Documents. CITY's Representative will not be required to make exhaustive or continuous on-Site inspections to check the quality or quantity of the Work.

ARTICLE 9 DESIGN PROFESSIONAL's STATUS DURING CONSTRUCTION

9.01 General Scope of DESIGN PROFESSIONAL's Duties

A. DESIGN PROFESSIONAL's efforts will be directed toward providing for CITY a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of visits to the Site and on-Site observations, DESIGN PROFESSIONAL will keep CITY informed of the progress of the Work and will endeavor to guard CITY against defective Work. DESIGN PROFESSIONAL's visits to the Site and on-Site observations are subject to all the limitations on DESIGN PROFESSIONAL's authority and responsibility set forth in Paragraph 9.08.

9.02 Resident Project Representative

A. If CITY and DESIGN PROFESSIONAL agree, DESIGN PROFESSIONAL will furnish a resident Project representative to assist DESIGN PROFESSIONAL in providing more extensive observation of the Work. The responsibilities, authority and limitations thereon of any such resident Project representative and assistants will be as provided in Paragraph 9.08 and in the Supplementary Conditions.

9.03 Clarifications and Interpretations

A. DESIGN PROFESSIONAL will issue with reasonable promptness written clarifications or interpretations (which may be in the form of Drawings) of the requirements of the Drawings and Specifications prepared by the DESIGN PROFESSIONAL as DESIGN PROFESSIONAL may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on CITY and CONTRACTOR. If CITY or CONTRACTOR believes that a written clarification or

interpretation justifies an adjustment in the Contract Price pursuant to Article 11 and/ or the Contract Times pursuant to Article 12 and the parties are unable to agree to the amount or extent thereof, if any, a Claim may be made therefore as provided in Article 16.

9.04 Rejecting Defective Work

A. DESIGN PROFESSIONAL will have authority to disapprove or reject Work which DESIGN PROFESSIONAL believes to be defective, that DESIGN PROFESSIONAL believes will not produce a completed Project that conforms to the Contract Documents, or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. DESIGN PROFESSIONAL will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04 B, whether or not the Work is fabricated, installed or completed.

9.05 Shop Drawings, Change Orders and Payments

A. In connection with DESIGN PROFESSIONAL's authority as to Shop Drawings and Samples, see Paragraph 6.18.

B. In connection with DESIGN PROFESSIONAL's authority as to Change Orders, see Article 10.

C. In connection with DESIGN PROFESSIONAL's authority as to Applications for Payment, see Article 14.

9.06 Determinations for Unit Prices

A. DESIGN PROFESSIONAL will initially determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. DESIGN PROFESSIONAL will review with CONTRACTOR the DESIGN PROFESSIONAL's preliminary determinations on such matters before rendering a written opinion thereon (by recommendation of an Application for Payment or otherwise to the CITY). CITY reserves the right to make a final determination of the actual quantities and classifications of Unit Price Work in reviewing an Application for Payment. Within ten (10) days after the date of receipt of any such decision, CONTRACTOR may deliver to CITY and to DESIGN PROFESSIONAL written notice of intention to appeal CITY's decision pursuant to Article 16.

9.07 Decisions on Requirements of Contract Documents and Acceptability of Work

A. DESIGN PROFESSIONAL will be the initial interpreter of the requirements of the Drawings and Specifications prepared by DESIGN PROFESSIONAL and judge of the acceptability of the Work thereunder.

B. When functioning as interpreter and judge under this Paragraph 9.07, DESIGN PROFESSIONAL will not show partiality to OWNER or CONTRACTOR.

C. Claims, disputes and other matters relating to the acceptability of the Work, quantities and classifications of Unit Price Work, or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work will be referred initially to CITY's Representative in writing with a request for a formal decision in accordance with Article 16.

9.08 Limitations on DESIGN PROFESSIONAL's Authority and Responsibilities

A. Neither DESIGN PROFESSIONAL's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by DESIGN PROFESSIONAL in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by DESIGN PROFESSIONAL shall create, impose or give rise to any duty owed by DESIGN PROFESSIONAL to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them.

B. DESIGN PROFESSIONAL will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws or Regulations applicable to the furnishing or performance of the Work. DESIGN PROFESSIONAL will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

C. DESIGN PROFESSIONAL will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

D. DESIGN PROFESSIONAL's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, Bonds and certificates of inspection, tests and approvals and other documentation required to be delivered by Paragraph 14.07 will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals, that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.08 shall also apply to DESIGN PROFESSIONAL's Consultants, resident Project representative and assistants as identified in the Supplementary Conditions.

ARTICLE 10 CHANGES IN THE WORK

10.01 Authorized Changes in the Work

A. Without invalidating the Contract and without notice to any surety, CITY may, at any time or from time to time, order additions, deletions or revisions in the Work. Such additions, deletions or revisions will be authorized by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved that will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If CITY and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price pursuant to Article 11 or an adjustment of the Contract Times pursuant to Article 12 or both that should be allowed as a result of a Work Change Directive, a Claim may be made therefore as provided in Article 16.

10.02 Unauthorized Changes in the Work

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.17 or in the case of uncovering Work as provided in Paragraph 13.04.

10.03 Signing of Change Orders

A. CITY and CONTRACTOR, and DESIGN PROFESSIONAL shall sign appropriate Change Orders covering:

1. changes in the Work which are:
 - a. ordered by CITY pursuant to Paragraph 10.01 A; or
 - b. required because of acceptance of defective Work under Paragraph 13.08 or correcting defective Work under Paragraph 13.09; or
 - c. agreed to by the parties;
2. changes in the Contract Price or Contract Times or both which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times or both which embody the substance of any written decision recommended by DESIGN PROFESSIONAL and approved by CITY pursuant to Paragraph 9.06, provided that, in lieu of signing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws or Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in Paragraph 6.19.

10.04 Notification to Surety

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times or both) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

ARTICLE 11 CHANGE OF CONTRACT PRICE

11.01 Change of Contract Price

A. The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at CONTRACTOR's expense without change in the Contract Price.

B. The Contract Price may only be changed by a Change Order. Any request for an adjustment in the Contract Price shall be based on written notice delivered within fourteen (14) calendar days after occurrence of the event giving rise to the request or within fourteen (14) calendar days after first recognition of the conditions giving rise to the request. Prior notice is not required for requests or claims relating to an emergency endangering life or property as described in Paragraph 6.16. Thereafter, the CONTRACTOR shall submit written documentation of its request, including appropriate supporting documentation, within ten (10) calendar days after giving notice, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted.

C. The value of any Work covered by a Change Order or of any request for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by Unit Prices contained in the Contract Documents, by application of such Unit Prices to the quantities of the items involved (subject to the provisions of Paragraph 11.04); or

2. where the Work involved is not covered by Unit Prices contained in the Contract Documents, by a mutually agreed lump sum; or

3. where the Work involved is not covered by Unit Prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 11.01 C.2, on the basis of the Cost of the Work (determined as provided in Paragraphs 11.02 A and B) plus a CONTRACTOR's fee for overhead and profit (determined as provided in Paragraph 11.01 D).

D. The CONTRACTOR's fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.02 A.1 and 11.02 A.2, the CONTRACTOR's fee shall be ten percent (10%);

b. for costs incurred under Paragraph 11.02 A.3, the CONTRACTOR's fee shall be five percent (5%);

c. where one or more tiers of subcontracts are on the basis of the Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01 D.2 and 11.02 A.1 through A.3 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be paid a fee of ten percent (10%) of the costs incurred by such Subcontractor under Paragraphs 11.02 A.1 and 11.02 A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent (5%) of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.02 A.4, 11.02 A.5 and 11.02 B;

e. the amount of credit to be allowed by CONTRACTOR to CITY for any change which results in a net decrease in cost will be the amount of the actual net decrease in costs plus a deduction in CONTRACTOR's fee by an amount equal to five percent (5%) of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.01 D.2.a through 11.01 D.2.e, inclusive.

E. Whenever the Cost of the Work is to be determined pursuant to Paragraphs 11.02 A and B, CONTRACTOR shall establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to CITY an itemized cost breakdown together with supporting data.

11.02 Cost of the Work

A. The term "Cost of the Work" means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a request for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the request. Except as otherwise agreed to in writing by CITY, costs covered by Change Orders or requests shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any costs itemized in 11.02 B:

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work, using occupational titles and job classifications agreed upon by CITY and CONTRACTOR. Such employees shall include, without limitation, job Site superintendents, foremen and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing the Work after regular working hours, on Saturdays, Sundays or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated into the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless CITY deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to CITY. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to CITY, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed or furnished by Subcontractors. If required by CITY, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to CITY who will then determine, with the advice of DESIGN PROFESSIONAL, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of the Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in Paragraphs 11.01 D and E and 11.02 A and B. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work when such services are approved in advance by CITY in writing.

5. Other costs including the following:

a. The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the Site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by CITY with the advice of DESIGN PROFESSIONAL, and the costs of transportation, loading, unloading, installation, assembly, dismantling and removal thereof, all in accordance with the terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

d. Applicable sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws or Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses required to perform the Work.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by CITY in accordance with Article 5), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of CITY. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for those services a fee proportionate to that stated in Paragraph 11.01 D.2.

g. The cost of utilities, fuel and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage and similar petty cash items in connection with the Work.

i. Cost of premiums for additional or increased Bonds, or for insurance required because of approved changes in the Work.

B. Costs excluded: The term “Cost of the Work” shall not include any of the following:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the Site or in CONTRACTOR's principal or a branch office for general administration of the Work (if not specifically included in the agreed upon occupational titles and job classifications referred to in Paragraph 11.02 A.1 or specifically covered by Paragraph 11.02 A.4), all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials, or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 11.02 A.

11.03 Cash Allowances

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to CITY. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment, an appropriate Change Order will be issued by CITY to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.04 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made in accordance with Paragraph 9.06.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. CITY or CONTRACTOR may negotiate an adjustment of the price per unit of Unit Price Work stated in the Contract if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs by twenty percent (20%) or more from the estimated quantity of such item indicated in the Contract; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or CITY believes that CITY is entitled to a decrease in Contract Price.

11.05 Dispute Resolution

A. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price in accordance with Article 11 within fourteen (14) calendar days from the receipt of supporting documentation of the request pursuant to 11.01.B., unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted, then a Claim for such adjustment may be made pursuant to Article 16.

ARTICLE 12 CONTRACT TIMES

12.01 Time of the Essence

A. All times stated in the Contract Documents are of the essence of the Contract.

12.02 Change of Contract Times

A. The Contract Times (or Milestones) may only be changed by a Change Order. Any request for an adjustment in the Contract Times shall be based on written notice delivered within fourteen (14) calendar days after occurrence of the event giving rise to the request or within fourteen (14) calendar days after first recognition of the conditions giving rise to the request. Thereafter, the CONTRACTOR shall submit written documentation of its requests, including appropriate supporting documentation, within ten (10) days after giving notice, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted.

12.03 Proof Required To Justify an Extension of Time For Excusable and Compensable Delays

A. In support of any request for an extension of the Contract Times pursuant to this Article, CONTRACTOR must demonstrate to the reasonable satisfaction of the CITY that the critical path of the approved baseline project schedule was delayed. CONTRACTOR shall be entitled to an increase in contract time for the number of days that the critical path was delayed solely as a result of the compensable or excusable event. A compensable or excusable event includes, but is not limited to:

1. unreasonable delay of issuance of Notice to Proceed by CITY;
2. CITY's unreasonable delay of delivery furnished materials, equipment, or work;
3. unreasonable delay responding to shop drawings and submittals;
4. CITY's unreasonable delay in issuing a Change Order;
5. an order by the CITY to stop the Work where the CONTRACTOR was not at fault; and
6. other reasonable grounds as determined by the City in its sole discretion.

B. CONTRACTOR shall compare the critical path of the approved baseline project schedule to the actual critical path of the Work, identifying the specific impact of the compensable or excusable event.

C. CONTRACTOR shall submit to the CITY a written time impact analysis illustrating the influence of each compensable or excusable event on the date of Substantial Completion. The

time impact analysis shall demonstrate the time impact based on the date of the delay in time and the event time computations or all affected activities.

D. If the critical path of the Work is delayed by "Force Majeure", the CONTRACTOR shall be entitled only to an extension of the Contract Times for the number of days of delay to the critical path. For purposes of this paragraph, "Force Majeure" shall mean fire, tornado, flood, earthquake, war, act of terrorism, civil disturbance, or labor strikes away from the project site.

E. Extensions of contract time pursuant to the this section will be granted only to the extent that the time adjustments exceed the total float time available when the event causing the delay occurred.

12.04 Delays Within CONTRACTOR's Control

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 Delays Beyond the CITY's and CONTRACTOR's Control

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both CITY and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 Delay Damages

A. In no event shall CITY be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR, or
2. delays beyond the control of CITY or CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this Paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inaction of CITY, DESIGN PROFESSIONAL, Consultant or anyone for whom CITY, DESIGN PROFESSIONAL or Consultant is responsible.

12.07 Dispute Resolution

A. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Time in accordance with Article 12 within fourteen (14) calendar days from the receipt of supporting documentation of the request pursuant to 12.02, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted, then a Claim for such adjustment may be made pursuant to Article 16.

ARTICLE 13 TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Access to Work

A. CITY, DESIGN PROFESSIONAL, Consultants, other representatives and personnel of CITY, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Site and Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.02 Tests and Inspections

A. CONTRACTOR shall give DESIGN PROFESSIONAL and CITY's Representative timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. If any Work (or the work of others at the Site) that is to be inspected, tested or approved is covered by CONTRACTOR without written approval required by Paragraphs 13.02 D or 13.02 E, it must, if requested by CITY's Representative, be uncovered for observation.

C. Uncovering Work as provided in Paragraph 13.02 B, shall be at CONTRACTOR's expense unless CONTRACTOR has given DESIGN PROFESSIONAL and CITY's Representative timely notice of CONTRACTOR's intention to cover the same and DESIGN PROFESSIONAL and CITY's Representative have not acted with reasonable promptness in response to such notice.

D. If Laws or Regulations of any public body (including City) having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish DESIGN PROFESSIONAL and CITY's Representative the required certificates of inspection or approval.

E. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for CITY's and DESIGN PROFESSIONAL's acceptance of materials or equipment to be incorporated into the Work, or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation into the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to CITY and DESIGN PROFESSIONAL.

F. CITY shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests or approvals covered by Paragraph 13.02 D and E;
2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04 B shall be paid as provided in said Paragraph 13.04 B; and
3. as otherwise specifically provided in the Contract Documents.

13.03 Notice of Defects

A. Prompt notice of all defective Work of which either CITY or DESIGN PROFESSIONAL has actual knowledge will be given to CONTRACTOR. Defective Work may be rejected, corrected or accepted as provided in this Article 13.

13.04 Uncovering Work

A. If any Work (or the work of others at the Site) is covered contrary to the written request of DESIGN PROFESSIONAL or CITY's Representative, it must, if requested by CITY's Representative, be uncovered for DESIGN PROFESSIONAL's or CITY's Representative's observation and replaced at CONTRACTOR's expense.

B. If CITY considers it necessary or advisable that covered Work be observed by DESIGN PROFESSIONAL or CITY's Representative or be inspected or tested by others, CONTRACTOR, at CITY's request, shall uncover, expose or otherwise make available for observation, inspection or testing as may be required, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction

(including but not limited to all costs of repair or replacement of work of others); and CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefore as provided in Article 16.

13.05 CITY May Stop the Work

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, CITY may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of CITY to stop the Work shall not give rise to any duty on the part of CITY to exercise this right for the benefit of CONTRACTOR, any Subcontractor, Supplier, other individual or entity or any surety or employee or agent of any of them.

13.06 Correction or Removal of Defective Work

A. If required by CITY, CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by either DESIGN PROFESSIONAL or CITY's Representative, remove it and replace it with Work that is not defective. CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 Correction Period

A. If within one (1) year after the date of Substantial Completion, or such longer period of time as may be prescribed by Laws or Regulations, by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by CITY or permitted by Laws and Regulations as contemplated in Paragraph 6.10 is found to be defective, CONTRACTOR shall promptly, without cost to CITY and in accordance with CITY's written instructions:

1. correct the repair of damages to such land or areas; or
2. correct such defective Work, or if it has been rejected by CITY, remove it from the Site and replace it with Work that is not defective; and
3. satisfactorily correct or remove and replace any damage to other Work or to the work of others or damage to other lands or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in the event of an emergency where delay by CONTRACTOR would cause serious risk of loss or damage, CITY may have the defective Work corrected or the rejected Work removed and replaced, and all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder

with respect to such Work will be extended for an additional period of one (1) year, or such longer period of time as may be prescribed within Paragraph 13.07 A, after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or waiver of the provisions of any applicable statute of limitation or repose.

13.08 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, CITY prefers to accept it, CITY may do so. CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to CITY's evaluation of and determination to accept such defective Work and shall pay OWNER for the diminished value of the Work. If any such acceptance occurs prior to DESIGN PROFESSIONAL's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work and, due to the diminished value of the Work, CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. If the acceptance of defective Work occurs after such recommendation, an appropriate amount shall be paid by CONTRACTOR to CITY.

13.09 CITY May Correct Defective Work

A. If CONTRACTOR fails within a reasonable time after written notice from DESIGN PROFESSIONAL or CITY's Representative to correct defective Work or to remove and replace rejected Work as required by CITY in accordance with Paragraph 13.06, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, CITY may, after seven (7) days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. CITY shall proceed expeditiously when exercising the rights and remedies under this Paragraph 13.09. In connection with such corrective and remedial action, CITY may exclude CONTRACTOR from all or part of the Site; take possession of all or part of the Work and suspend CONTRACTOR's services related thereto; take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site; and incorporate into the Work all materials and equipment stored at the Site or for which CITY has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow CITY, CITY's Representative, agents and employees, CITY's other contractors, DESIGN PROFESSIONAL and Consultants access to the Site to enable CITY to exercise the rights and remedies under this Paragraph 13.09.

C. All costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by CITY in exercising such rights and remedies will be charged against CONTRACTOR and a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work; and CITY shall be entitled to an appropriate decrease in the Contract Price. If CITY and CONTRACTOR are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. Such Claims for costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal and replacement of CONTRACTOR's defective or rejected Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by CITY of CITY's rights and remedies under Paragraphs 13.06 and 13.09.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

A. 01290.02 Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into form 01290.01 Application for Payment acceptable to DESIGN PROFESSIONAL and CITY. Progress payments for Unit Price Work will be based on the number of units completed.

14.02 Application for Progress Payments

A. Application for Payment

1. At least twenty (20) days before the date stipulated in the Supplementary Conditions for each progress payment (but not more often than once a month), CONTRACTOR shall submit to DESIGN PROFESSIONAL for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated into the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, paid invoice or other documentation warranting that CITY has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect CITY's interest therein, all of which will be subject to CITY's approval.

2. Beginning with the second Application for Payment, each Application shall include:

a. an affidavit of CONTRACTOR stating that all previous progress payments received for the Work have been applied to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment, and

b. a copy of the most recent 00485.01 M/WBE Monthly Utilization Report CONTRACTOR has submitted to the CITY's Civil Rights and Equal Opportunity Department.

c. a copy of the most recent 00485.02 Project Workforce Monthly Report and 00485.03 Company-Wide Workforce Monthly Report CONTRACTOR has submitted to the OWNER's Civil Rights and Equal Opportunity Department.

d. an update to the approved schedule pursuant to paragraphs 6.04 and 6.05.

3. The amount of retainage with respect to progress payments will be stated in the Supplementary Conditions.

B. Review of Applications

1. DESIGN PROFESSIONAL will, within ten (10) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to CITY, or return the Application to CONTRACTOR indicating in writing DESIGN PROFESSIONAL's reasons for refusing to recommend payment. In the latter case, CONTRACTOR shall make the necessary corrections and resubmit the Application.

a. After presentation of the Application for Payment to CITY, and if CITY's Representative agrees with DESIGN PROFESSIONAL's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02 B.4) become due and will be paid by CITY to CONTRACTOR, subject to the provisions of Laws or Regulations.

b. No payment shall be approved until the CONTRACTOR has submitted with the Application accompanying documentation as required by the Contract Documents, including, but not limited to, the documentation required by paragraphs 6.04 and 6.05.

2. DESIGN PROFESSIONAL's recommendation of any payment requested in an Application for Payment will constitute a representation by DESIGN PROFESSIONAL to CITY, based on DESIGN PROFESSIONAL's observations of the executed Work as an experienced and qualified DESIGN PROFESSIONAL and on DESIGN PROFESSIONAL's

review of the Application for Payment and the accompanying data and schedules, that to the best of DESIGN PROFESSIONAL's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
- b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.06, and to any other qualifications stated in the recommendation); and
- c. the conditions precedent to CONTRACTOR being entitled to such payment appear to have been fulfilled in so far as it is DESIGN PROFESSIONAL's responsibility to observe the Work.

3. DESIGN PROFESSIONAL's recommendation of any payment, including final payment, shall not mean that DESIGN PROFESSIONAL is responsible for CONTRACTOR's means, methods, techniques, sequence or procedures of construction, safety precautions and programs incident thereto, or any failure of CONTRACTOR to comply with Laws or Regulations applicable to the furnishing or performance of Work.

4. DESIGN PROFESSIONAL may refuse to recommend the whole or any part of any payment if, in DESIGN PROFESSIONAL's opinion, it would be incorrect to make the representations to CITY referred to in Paragraph 14.02 B.2. DESIGN PROFESSIONAL may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in DESIGN PROFESSIONAL's opinion to protect CITY from loss because:

- a. the Work is defective, or completed Work has been damaged requiring correction or replacement;
- b. the Contract Price has been reduced by Written Amendment or Change Orders;
- c. CITY has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. DESIGN PROFESSIONAL has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.

C. Reduction in Payment

1. CITY may refuse to make payment of the full amount recommended by DESIGN PROFESSIONAL because:

- a. Claims have been made by third parties against CITY on account of CONTRACTOR's performance or furnishing of the Work; or
- b. Claims have been made by CITY against CONTRACTOR in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to CITY to secure the satisfaction and discharge of such Claims;
- c. there are other items entitling CITY to a set-off against the amount recommended; or
- d. CITY has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02 B.4.a through c or 15.02 A.1 through 4; but CITY must give CONTRACTOR written notice (with a copy to DESIGN PROFESSIONAL) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by CITY and CONTRACTOR, when CONTRACTOR corrects to CITY's satisfaction the reasons for such action; or
- e. CITY has made a different determination of the actual quantities and classifications of Unit Price Work.

14.03 CONTRACTOR's Warranty of Title

A. CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated into the Project or not, will pass to CITY no later than the time of payment, free and clear of all Liens.

14.04 Substantial Completion

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify CITY and DESIGN PROFESSIONAL in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that CITY issue a certificate of Substantial Completion. Within a reasonable time thereafter, CITY, together with CONTRACTOR and DESIGN PROFESSIONAL, shall make an inspection of the Work to determine the status of completion. If DESIGN PROFESSIONAL does not consider the Work substantially complete, DESIGN PROFESSIONAL will notify CONTRACTOR and CITY in writing giving the reasons therefore. If DESIGN PROFESSIONAL considers the Work substantially complete, DESIGN PROFESSIONAL will prepare and deliver to CITY a recommended certificate of Substantial Completion that shall establish the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. CITY shall have seven (7) days after receipt of the recommended certificate during which to make written objection to DESIGN PROFESSIONAL as to any provisions of the certificate or attached list. At the time of delivery of the recommended certificate of Substantial Completion, DESIGN PROFESSIONAL will deliver to CITY and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between CITY and CONTRACTOR with respect to security, operation, safety, protection of the Work, maintenance, heat, utilities, insurance and warranties and guarantees.

B. CITY shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but CITY shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.05 Partial Utilization

A. Use by CITY at CITY's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which CITY, DESIGN PROFESSIONAL and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by CITY for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

1. CITY at any time may request CONTRACTOR in writing to permit CITY to use any such part of the Work which CITY believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to CITY and DESIGN PROFESSIONAL that such part of the Work is substantially complete and request CITY to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify CITY and DESIGN PROFESSIONAL in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request CITY to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, CITY, together with CONTRACTOR and DESIGN PROFESSIONAL, shall make an inspection of that part of the Work to determine its status of completion. If DESIGN PROFESSIONAL does not consider that part of the Work to be substantially complete, DESIGN PROFESSIONAL will notify CITY and CONTRACTOR in writing, giving the reasons therefore. If DESIGN PROFESSIONAL considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of Paragraph 5.09 with respect to property insurance.

14.06 Final Inspection

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, DESIGN PROFESSIONAL will make a final inspection with CITY and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 Final Payment

A. Application for Payment

1. After CONTRACTOR has completed all corrections required by Paragraph 14.06 to the satisfaction of DESIGN PROFESSIONAL and CITY's Representative and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by Paragraph 5.04, certificates of inspection, marked-up record documents (as provided in Paragraph 6.13) and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation required by the Contract Documents, including but not limited to the evidence of insurance required by Subparagraph 5.04 B.7; and

b. 01290.14 "Contractor Affidavit for Final Payment" from CONTRACTOR and 01290.15 "Subcontractor Affidavit for Final Payment" from all Subcontractors, regardless of tier.

B. Review of Application and Acceptance

1. If, on the basis of DESIGN PROFESSIONAL's and CITY's Representative's observation of the Work during construction and final inspection, and DESIGN PROFESSIONAL's and CITY's Representative's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, DESIGN PROFESSIONAL and CITY's Representative are satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, DESIGN PROFESSIONAL will, within ten (10) days after receipt of the final Application for Payment, indicate in writing DESIGN PROFESSIONAL's and CITY's Representative's recommendation of payment and present the Application to CITY for payment. At the same time DESIGN PROFESSIONAL will also give written notice to CITY and CONTRACTOR that the Work is acceptable subject to the provisions of Paragraph 14.09.

2. Otherwise, DESIGN PROFESSIONAL will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application to DESIGN PROFESSIONAL. After the presentation to CITY of the Application and accompanying documentation, in appropriate form and substance, including applicable federal and state prevailing wage provisions, and with DESIGN PROFESSIONAL's recommendation and notice of acceptability, the amount recommended by DESIGN PROFESSIONAL will become due and will be paid by CITY to CONTRACTOR in accordance with Laws and Regulations.

14.08 Final Completion Delayed

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if DESIGN PROFESSIONAL so recommends and CITY concurs, CITY shall, upon

receipt of CONTRACTOR's final Application for Payment and recommendation of DESIGN PROFESSIONAL, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by CITY for Work not fully completed or corrected is less than the retainage stipulated in the Supplementary Conditions, and if Bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to DESIGN PROFESSIONAL with the Application for Payment. Payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

A. The making and acceptance of final payment will constitute:

1. a waiver of all claims by CITY against CONTRACTOR, except claims previously made in writing and still unsettled, or claims arising from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against CITY other than those previously made in writing pursuant to Paragraphs 16.02 and 16.03 and still unsettled.

14.10 Completion of Work by CITY

A. If CITY must complete the Work, all costs and charges incurred by CITY, together with the cost of completing the Work under the Contract, will be deducted from any monies due or which may become due CONTRACTOR. If such expense exceeds the sum which would have been payable under the Contract, then CONTRACTOR and the surety shall be liable and shall pay to CITY the amount of such excess.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.01 CITY May Suspend Work

A. Notwithstanding any other provision of this Contract, at any time and without cause, and at its sole and absolute discretion, CITY, may suspend the Work or any portion of the Work by written notice to CONTRACTOR, which will initially fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed in the notice unless the date is changed by a subsequent written notice from CITY. CONTRACTOR may be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any suspension if CONTRACTOR makes a Claim therefore in accordance with Article 16.

B. CONTRACTOR will not be allowed an adjustment in the Contract Price or an extension of the Contract Times if CITY suspends the Work because CONTRACTOR's acts or omissions create or cause an emergency that CITY believes affects the safety or protection of persons, the Work, or property at the Site or adjacent thereto. CITY may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been adequately addressed by CONTRACTOR; however, this right of CITY to stop the Work shall not give rise to any duty on the part of CITY to exercise this right for the benefit of CONTRACTOR, any Subcontractor, Supplier, other individual or entity or any surety or employee or agent of any of them.

15.02 CITY May Terminate for Default

A. CONTRACTOR may be deemed in default and CITY may terminate the services of CONTRACTOR upon the occurrence of any one or more of the following events:

1. CONTRACTOR fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under Paragraph 2.06 and 2.07 as adjusted from time to time pursuant to Paragraphs 6.04, 6.05, 12.02 and 12.03);

2. CONTRACTOR abandons the Work or declares its intention to abandon the Work;
3. CONTRACTOR assigns or attempts to assign its rights or obligations under this Contract or any part thereof to any third party without the prior written consent of CITY;
4. CONTRACTOR fails to make prompt payment duly owing to any subcontractor for Work completed in accordance to the Contract Documents or material supplier for materials delivered for incorporation into the Work within thirty (30) calendar days after payment was due;
5. CONTRACTOR fails to achieve the required dates of substantial and final completion;
6. CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;
7. CONTRACTOR disregards the authority of DESIGN PROFESSIONAL or OWNER;
or
8. CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents.

B. CITY may, after giving CONTRACTOR (and the surety) seven (7) days written notice and to the extent permitted by Laws or Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the Site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate into the Work all materials and equipment stored at the Site or for which CITY has paid CONTRACTOR but which are stored elsewhere, and finish the Work as CITY may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CITY arising out of or resulting from completing the Work, such excess may be paid to CONTRACTOR. If such costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to CITY within fourteen (14) calendar days of CITY'S demand for payment. When exercising any rights or remedies under this Paragraph CITY shall not be required to competitively bid this work unless required by law.

C. Where CONTRACTOR's services have been so terminated by CITY, the termination will not affect any rights or remedies of CITY against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by CITY will not release CONTRACTOR from liability.

D. If, after a default termination, it is determined that the CONTRACTOR was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the CITY. The CITY shall then be liable to CONTRACTOR for only those costs enumerated in paragraph 15.03.

15.03 CITY May Terminate for Convenience

A. Notwithstanding any other provision of this Contract, upon seven (7) calendar days written notice to CONTRACTOR, CITY may, at its sole and absolute discretion, without cause and without prejudice to any other right or remedy of CITY, elect to terminate the Contract. In such case, CONTRACTOR shall, with thirty (30) calendar days of receiving notice of termination under this paragraph, submit to CITY its statement of costs and expenses and shall be paid:

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

4. for reasonable expenses directly attributable to termination if approved in advance by CITY.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

C. CONTRACTOR waives any costs not submitted to CITY pursuant to paragraph 15.03.A.

D. CITY shall, within thirty (30) calendar days after receipt of CONTRACTOR's statement, pay CONTRACTOR all amounts it determines are properly determined.

ARTICLE 16 CLAIMS AND DISPUTES

16.01 Definition

A. A Claim is a demand or assertion by the CONTRACTOR seeking, as a matter of right, the adjustment of Contract price and/or times with respect to the terms of the Contract.

16.02 Written Notice and Burden of Proof

A. Claims must be made by written notice pursuant to Paragraph 17.01. The written notice shall clearly indicate that the CONTRACTOR is making a claim. The responsibility to substantiate Claims shall rest with the CONTRACTOR. No Claim may be made under this Contract except as provided in this Article.

B. Certification of Claim: The written notice of Claim shall include the following statement signed by the CONTRACTOR's representative: "The CONTRACTOR certifies that all statements made and the facts set out in this claim are true and correct and that no false records have been submitted in support of this claim." **Strict compliance with this paragraph shall be a condition precedent to the creation, existence or validity of any Claim.**

16.03 Time Limits on Claims

A. The CONTRACTOR must give notice to the CITY within fourteen (14) calendar days after the denial of a request for or failure to reach an agreement on a change in Contract Price and/or change in Contract Time pursuant to Article 11 and Article 12 respectively. After the fourteen (14) day period for making Claims has expired, the Claim shall be considered waived.

B. The CONTRACTOR shall submit the Claim to the CITY's Representative.

16.04 Continuing Contract Performance

A. Pending final resolution of a Claim, unless otherwise agreed in writing, the CONTRACTOR shall proceed diligently with performance of the Work and the CITY shall continue to make payments in accordance with the Contract Documents. The CITY may, but is not obligated to, notify the Surety of the nature and amount of the Claim.

16.05 Injury or Damage to Person or Property

A. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts that party is legally liable, written notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding thirty (30) days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter.

16.06 Initial Resolution of Claims and Disputes

A. After the CONTRACTOR has submitted the Claim to the CITY'S Representative, the CITY'S Representative and CONTRACTOR'S Representative shall conduct a settlement conference within fourteen (14) calendar days from the date of receipt of the Claim. If the Claim is not settled within seven (7) calendar days following the date of the settlement conference, the CITY'S Representative and the CONTRACTOR's Representative shall state, in writing, following the conclusion of the seven (7) calendar day period, their respective position as to the matters in dispute.

B. The CITY'S and CONTRACTOR'S statement of positions shall state all known factual grounds for each party's position. If the dispute remains unresolved at the end of the seven (7) calendar days from submission of the parties' written position statements, the CONTRACTOR shall have the right to proceed with the pursuit of Claims pursuant to paragraph 16.07.

C. If a Claim has been resolved, the OWNER will prepare or obtain appropriate documentation.

16.07 Final Resolution of Claims and Disputes

A. All administrative procedures set forth in this contract must first be exhausted before suit is filed.

B. If the CITY'S Representative and the CONTRACTOR'S Representative are unable to resolve the dispute pursuant to 16.06, the parties must submit their statements of position to the Director, who shall review the Claim and make a decision within fourteen (14) calendar days.

C. Absent fraud, gross mistake or bad faith, the Director's decision shall be final and binding on CITY and CONTRACTOR within fourteen (14) calendar days after issuance. The CONTRACTOR shall give written notice to the CITY stating its intent to submit its Claim to a court of law pursuant to paragraph 17.05.A. within thirty (30) calendar days after notice of Director's decision.

D. The time frames for the Director's decision and for CONTRACTOR'S written notice of intent may be tolled by participation in voluntary mediation. Mediator selection and the procedures to be employed in voluntary mediation shall be mutually acceptable to the parties. Costs of the mediator shall be shared equally among the parties participating in the mediation. In no event shall any time frame be tolled more than 30 days for mediation. However, mediation may be employed at any time at the discretion and mutual agreement of the parties.

E. If the dispute is not resolved during voluntary mediation, The CONTRACTOR agrees that it will file no suit based on facts or evidentiary materials that were not presented for consideration to the CITY during the mediation process or of which the CONTRACTOR had knowledge and failed to present during the administrative procedures.

ARTICLE 17 MISCELLANEOUS

17.01 Giving Notice

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be given by personal delivery, by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice or by confirmed electronic facsimile transmission. Notice is effective on the date of personal delivery, deposit of registered or certified mail, postage prepaid, or confirmed electronic facsimile transmission.

17.02 Computation of Times

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last calendar day of such period. If the last day of such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 Cumulative Remedies

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the

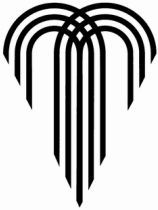
warranties, guarantees and obligations imposed upon CONTRACTOR and all of the rights and remedies available to CITY and DESIGN PROFESSIONAL hereunder are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

17.04 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract.

17.05 Controlling Law

A. This Contract shall be construed and governed in accordance with the laws of the State of Missouri without giving effect to Missouri's choice of law provisions. The CITY and CONTRACTOR: (1) shall submit exclusively to the jurisdiction of the state and federal courts located in Jackson County, Missouri and no other; (2) shall waive any and all objections to jurisdiction and venue; and (3) shall not raise forum non conveniens as an objection to the location of any litigation.



SUPPLEMENTARY CONDITIONS

Project/Contract Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

SC-2.03 A. Article 2, Paragraph 2.03, Copies of Documents, is amended by deleting Paragraph 2.03 A and replacing it with the following:

- A. CITY shall furnish to CONTRACTOR up to One (1) copies of the Drawings and Specifications, including Addenda.

In the preparation of the Contract Documents, no reports of explorations and tests of subsurface conditions at or contiguous to the Site of the Work have been prepared.

In the preparation of the Contract Documents, no drawings of physical conditions in or relating to existing surface or subsurface structures which are at or contiguous to the Site of the Work were utilized.

SC-4.06 Article 4, Paragraph 4.06, Asbestos, Lead-Based Paint, PCBs, Petroleum Waste or Radioactive Material, Subparagraphs A and B are supplemented as follows:

In the preparation of the Contract Documents, the following reports and drawings relating to a Hazardous Environmental Condition identified at the Site of the Work were utilized:

1.
 - a. Report dated September 11, 1995, prepared by Anlab Environmental; entitled Annual Asbestos Removal and Repairs at Various WSD Facilities - Contract No. 669 (Binder), which may be reviewed at *Kansas City Water Services 4800 E 63rd Street, Kansas City, MO 64130*. The technical data contained in such report upon which CONTRACTOR may rely is location and type of Asbestos.
 - b. Report dated October 1990, prepared by B&V Waste Science and Technology Corp.; entitled Blue River Wastewater Treatment Plant Asbestos Assessment Report, which may be reviewed at *Kansas City Water Services 4800 E 63rd Street, Kansas City, MO 64130*. The technical data contained in such report upon which CONTRACTOR may rely is location and type of Asbestos.

SC- 5.01 A. Article 5, Paragraph 5.01, Performance, Payment and Other Bonds, Subparagraph A, second sentence, is revised as follows:

These Bonds shall remain in effect at least until two (2) years after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents.

SC-5.03 A. Article 5, Paragraph 5.03 Certificates of Insurance, Subparagraph A is amended by adding the following Subparagraph 1:

1. CONTRACTOR shall obtain evidence that all Subcontractors have in force the required coverage in the amounts required by these Contract Documents, and evidence that each is

current on its unemployment insurance payments before Subcontractors begin Work at the Site. CONTRACTOR shall retain such evidence in its files and make available to CITY within ten (10) days after written request.

SC-5.04 C. Article 5, Paragraph 5.04, CONTRACTOR's Liability Insurance, Subparagraph C is amended as follows:

The following additional policies of insurance are required:

6. Environmental Liability Insurance. This insurance shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against claims for injuries to members of the public and damage to the property of others resulting from environmental impairment. The liability limits of the environmental policy shall not be less than \$2,000,000.
7. Asbestos Liability Insurance. This insurance shall be an "occurrence" policy and shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against all claims arising from bodily injury, sickness, disease or death of any person other than the CONTRACTOR's employees arising out of any act related to asbestos abatement work. The liability limits for bodily injury and property damage shall be not less than:

\$1,000,000 each occurrence

\$2,000,000 general aggregate

If CONTRACTOR provides Environmental or Asbestos Liability Insurance through a Subcontractor, CONTRACTOR shall contractually require the Subcontractor to include CITY, DESIGN PROFESSIONAL and CONSULTANTS as additional insureds in the Subcontractor's policy. CONTRACTOR shall deliver to CITY, prior to the start of any Work at the Project Site, properly completed certificates of insurance or other evidence that the required insurance is in full force and effect, in a form acceptable to CITY. CONTRACTOR shall contractually require its Subcontractor to defend, indemnify and hold harmless CITY from and against all Claims arising out of or resulting from all acts or omissions in connection with this Contract caused in whole or in part by Subcontractor or Subcontractor's agents, regardless of whether or not caused in part by any act or omission, including negligence, of CITY. CONTRACTOR must provide evidence that this requirement has been complied in accordance with the provisions of Paragraphs 6.01 B and 6.06 G.

SC-5.06 A. Article 5, Paragraph 5.06, Property Insurance, Paragraph A, is amended by adding the following after the first sentence:

Property Insurance on the Work at the Site shall be written with a deductible amount not to exceed \$10,000.00.

SC-6.06 A.1 Article 6, Paragraph 6.06 Substitutes and "Or-Equal" Items, Paragraph A is amended by adding the following at the end of Paragraph A.1:

Proposed "or-equal" items must be submitted to CITY at least eleven (11) days prior to Bid date at the following address:

4800 East 63rd Street
Kansas City, Missouri 64130
Attn: David Elge, Project Manager

Only Bidders may submit proposed "or-equal" items and such items must require no change in related Work. Acceptance by CITY of any proposed "or-equal" items will be made by Addendum only.

SC-6.06 A.2. Article 6, Paragraph 6.06 Substitutes and "Or-Equal" Items, Paragraph A is amended by adding the following at the end of Paragraph A.2:

Proposed substitute items must be submitted to CITY's Representative not later than forty-five (45) days prior to the time the item is to be incorporated into the Work. Only CONTRACTOR may submit proposed substitute items, and such items must be submitted to CITY's Representative on the standard City form 01630 - Substitution Request. Acceptance by CITY of any proposed substitute item will be made by Change Order.

SC-6.07 J Article 6, Paragraph 6.07, concerning Subcontractors, Suppliers and Others, is supplemented by adding Subparagraph J as follows:

CONTRACTOR shall perform with its own organization Work amounting to not less than 15% of the total Contract Price. "Its own organization" shall be construed to include only workers employed and paid by the CONTRACTOR and equipment owned or rented by the CONTRACTOR, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the CONTRACTOR.

SC-6.10. Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraphs immediately following Subparagraph 6.10 I 2:

- a. CONTRACTOR will be required to comply with wage rates as follows:

County – Clay, Jackson, and Platte

Work Type: State – Building

SC-6.11. Article 6, Paragraph 6.11, Taxes, is amended by adding the following sentence to Subparagraph 6.11 B:

- B. Tax Compliance. The following subparagraphs apply if the Contract is over \$160,000.00.

[Instruction for 9.02 A: List responsibilities, authority and limitations of resident Project representative who is not the DESIGN PROFESSIONAL; list responsibilities of DESIGN PROFESSIONAL during construction. If not applicable, delete this SC. Be certain to remove this note before your final Contract Document is printed.]

SC-9.02 A. Article 9, Paragraph 9.02, Resident Project Representative, Subparagraph A is supplemented as follows:

The responsibilities, authority and limitations of authority of DESIGN PROFESSIONAL's resident Project representative as stated in Paragraph 9.08 are modified as follows:

SC-9.08 E. Article 9, Paragraph 9.08, Limitations on DESIGN PROFESSIONAL's Authority and Responsibilities, Subparagraph E is supplemented as follows:

DESIGN PROFESSIONAL's Consultant(s), resident Project representative and assistant(s) to the resident Project representative are the following:

Consultant(s): Black & Veatch Corporation and Taliaferro & Browne, Inc.

SC-12.01 Article 12, Paragraph 12.01, Time of the Essence is amended by adding the following new Subparagraphs immediately following Subparagraph 12.01 A:

- B. Starting and Completion

1. The Work to be performed under this Contract shall begin on the date specified in the written Notice to Proceed issued by the Director of KC Water, and the Work shall be substantially

complete, in accordance with Paragraph 14.04, **within 730 Calendar Days thereafter**. Once the Work starts, CONTRACTOR shall continuously pursue completion of the Work.

2. The Work shall be completed and ready for final payment in accordance with Paragraph 14.07 within 90 Calendar Days after the date of Substantial Completion of the Work.

C. Liquidated Damages

1. If the Work is not substantially completed, in accordance with Paragraph 14.04, within the period stated in Paragraph 12.01 B.1, CONTRACTOR shall pay to CITY the amount of two-thousand dollars (\$2,000) as liquidated damages and not as a penalty for each Calendar Day until the Work is substantially complete. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.
2. If the Work is not completed and ready for final payment in accordance with Paragraph 14.07, within the period stated in Paragraph 12.01 B.3, CONTRACTOR shall pay to CITY the amount of one thousand dollars (\$1,000) as liquidated damages and not as a penalty for each Calendar Day until the Work is completed and ready for final payment. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.

SC-13.07 Article 13, Paragraph 13.07, Correction Period, Subparagraph A is amended as follows:

The correction period set forth in Paragraph 13.07 A shall be two (2) years instead of one (1) year, which longer period of time shall also be applicable to the correction period set forth in Paragraph 13.07 C. All other provisions of Paragraph 13.07 remain unchanged except as necessary to accommodate the revised length of the correction period.

SC-14.01 Article 14, Paragraph 14.01, Add the following Subparagraph B and C as follows:

B. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

- a. Application for Payment forms with Continuation Sheets.

2. Submit the Schedule of Values to Project Manager for approval as indicated within the Contract. Refer to Article 2, Preliminary Matters; and Article 13, Payments to Contractor and Completion.

C. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide a minimum of one line item for each Specification Division and separate by facility as possible.

1. Prepare and submit the Schedule of Values using the Kansas City Schedule of values form 01290.02. AIA forms are not acceptable.
2. Provide a breakdown of the Contract Sum in detail. Coordinate with the Project Manual table of contents.
3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored.
5. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Provide separate lines for mobilization, demobilization, Manufacturers' Field Services, Operation and Maintenance Data, Warranty Documents, Equipment and Startup Data, Project

Record Documents, and contract close-out (Refer to Sections 01433, 01770, 01781, 01783, and 01914 for contract close out details).

7. Each item in the Schedule of Values and Applications for Payment shall be complete.

SC-14.02 A. Article 14, Paragraph 14.02, Application for Progress Payments, Subparagraph A is amended by deleting Item 3 and adding the following:

3. CITY shall make payments to CONTRACTOR monthly on or about the 15th day of each month. Payments to CONTRACTOR will be made on the basis of ninety-five percent (95%) of the value of the Work satisfactorily completed plus ninety-five percent (95%) of the value of properly stored and insured, unused materials on hand on the Site of the Work. CITY shall retain five percent (5%) of each partial payment until completion and acceptance of the Work covered by the Contract and final payment is due. All Work covered by a payment becomes CITY's property, provided that the Work paid for remains the sole responsibility of CONTRACTOR until all terms and conditions of the Contract have been met.

SC-14.02 A. Article 14, Paragraph 14.02, Application for Progress Payments, Subparagraph A is amended by adding the following:

4. Provide an updated Construction Schedule with each payment application.
5. Provide HRD Form 485.01 MWBE Monthly Utilization Report with each payment request.
6. Transmittal: Submit one signed and notarized original copies of each Application for Payment to Project Manager by a method ensuring receipt within 24 hours. The Application for Payment shall include waivers of lien and similar attachments if required.

SC-14.04. Article 14, Paragraph 14.04, Substantial Completion, Subparagraph A is supplemented as follows:

- A. To be considered substantially complete, the following items of the Work must be operational and ready for CITY's continuous use as intended:
 - Installation of all SCADA systems at the facilities
 - Startup and commissioning completed
 - Installation of fiber where applicable
 - Fiber testing must be complete and documented to demonstrate fiber is ready for use.

SC-14.05 Article 14, Paragraph 14.05, Partial Utilization is amended by adding the following new Subparagraph A.3. immediately following Subparagraph 14.05 A.2:

3. CITY at any time may make a written request to CONTRACTOR to permit CITY to take over operation of any part of the Work although it is not substantially complete. A copy of the request will be sent to DESIGN PROFESSIONAL, and within a reasonable time thereafter CITY, CONTRACTOR and DESIGN PROFESSIONAL shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not make written objection to CITY and DESIGN PROFESSIONAL that such part of the Work is not ready for separate operation by CITY, DESIGN PROFESSIONAL will finalize the list of items to be completed or corrected and will deliver such lists to CITY and CONTRACTOR. DESIGN PROFESSIONAL will also make a written recommendation as to the division of responsibilities pending final payment between CITY and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for that part of the Work, which recommendation will become binding upon CITY and CONTRACTOR at the time when CITY takes over such operation (unless they shall have otherwise agreed in writing and so informed DESIGN PROFESSIONAL). During such

operation and prior to Substantial Completion of such part of the Work, CITY shall allow CONTRACTOR reasonable access to complete or correct items on said list and to complete other related Work.

SECTION 00830

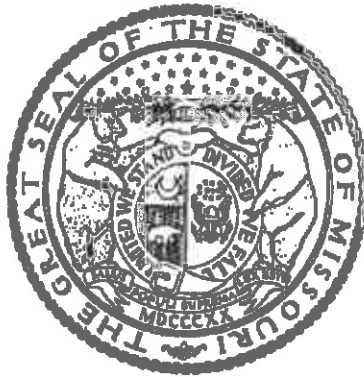
PREVAILING WAGE

1. Annual Wage Order No. 30
2. **0830.03 Division of Labor Standards Rules & Regulations** are incorporated into and made part of this Contract and are available at <http://s1.sos.mo.gov/cmsimages/adrules/csr/current/8csr/8c30-3.pdf>.

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

Annual Wage Order No. 30

Section 024
CLAY COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by _____

Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: _____ **March 10, 2023**

Last Date Objections May Be Filed: **April 10, 2023**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$65.71
Boilermaker	\$33.49*
Bricklayer	\$59.97
Carpenter	\$61.87
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$55.31
Plasterer	
Communications Technician	\$63.17
Electrician (Inside Wireman)	\$69.27
Electrician Outside Lineman	\$62.80
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$33.49*
Glazier	\$33.49*
Ironworker	\$67.92
Laborer	\$49.75
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$54.81
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$61.84
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$51.95
Plumber	\$75.62
Pipe Fitter	
Roofer	\$58.52
Sheet Metal Worker	\$70.85
Sprinkler Fitter	\$64.91
Truck Driver	\$33.49*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMO Section 290.210.

Heavy Construction Rates for
CLAY County

Section 024

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$61.71
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$62.80
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$50.36
General Laborer	
Skilled Laborer	
Operating Engineer	\$56.41
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$50.25
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME and HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, "overtime work" shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

Annual Wage Order No. 30

Section 048
JACKSON COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by

Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: March 10, 2023

Last Date Objections May Be Filed: April 10, 2023

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$68.67
Bollermaker	\$38.37*
Bricklayer	\$60.27
Carpenter	\$61.82
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$55.22
Plasterer	
Communications Technician	\$60.34
Electrician (Inside Wireman)	\$69.22
Electrician Outside Lineman	\$59.91
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$102.69
Glazier	\$58.17
Ironworker	\$68.53
Laborer	\$49.56
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$54.80
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$61.54
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$50.40
Plumber	\$76.04
Pipe Fitter	
Rofer	\$59.33
Sheet Metal Worker	\$72.78
Sprinkler Fitter	\$75.09
Truck Driver	\$52.39
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMO Section 290.210.

Heavy Construction Rates for
JACKSON County

Section 048

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$61.98
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$87.19
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$50.25
General Laborer	
Skilled Laborer	
Operating Engineer	\$58.85
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$50.18
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME and HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, "overtime work" shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

OVERTIME and HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, "overtime work" shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

Annual Wage Order No. 30

Section 083
PLATTE COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by

Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: _____ **March 10, 2023**

Last Date Objections May Be Filed: **April 10, 2023**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$68.54
Boilermaker	\$33.80*
Bricklayer	\$60.87
Carpenter	\$61.62
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$33.80*
Plasterer	
Communications Technician	\$63.38
Electrician (Inside Wireman)	\$68.28
Electrician Outside Lineman	\$58.82
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$33.80*
Glazier	\$33.80*
Ironworker	\$67.98
Laborer	\$48.19
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$54.59
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$61.68
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$53.97
Plumber	\$74.61
Pipe Fitter	
Roofer	\$58.79
Sheet Metal Worker	\$72.86
Sprinkler Fitter	\$66.39
Truck Driver	\$33.80*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMO Section 290.210.

Heavy Construction Rates for
PLATTE County

Section 083

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$61.99
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$58.82
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$49.79
General Laborer	
Skilled Laborer	
Operating Engineer	\$58.57
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$51.31
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME and HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, "overtime work" shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.



ADDENDUM NUMBER

Project Number: 81000819/1712

Project Title: Wastewater SCADA System Improvements Phase 2

[NOTE: Add Month/Date/Year for which this Addendum is officially posted by City. Be certain to remove this note before final document is printed.]

ISSUE DATE: _____

[NOTE: Addenda are used to clarify, revise, add to, or delete information in the original bidding documents or in previous addenda prior to opening of bids. Items should be organized in the same order as the original bidding documents Table of Contents. Cite the specific bidding document and the specific location within it where each change is to be made followed by the detailed change. If entire pages or documents are replaced or added as accompanying attachments, state the title of the document and the specific page number(s) removed and/or added. (e.g., Delete Section 01011 - Summary pages 1-6 and add the attached Section 01011 - Summary pages 1-10.). Be certain to remove this note before final document is printed.]

[NOTE: Add Month/Date/Year. Be certain to remove this note before final document is printed.]

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on _____, are amended as follows:

[NOTE: If the bid date is being changed add Month/Day/Year; if not, delete this sentence. Be certain to remove this note before final document is printed.]

The Bid date for this Project stated in Document 00130 - Invitation to Bid shall be changed to: 2:00 PM, on _____.

Information to Bidders The following is provided to Bidders for information only:

[NOTE: Include items under this heading such as Pre-bid meeting attendance list, soils report, etc.; items that should not be contractual, but are useful information to Bidders. Delete this heading and introduction if not applicable for this Addendum. Be certain to remove this note before final document is printed.]

- 1.
- 2.

[NOTE: Include Bidder/Proposer questions and answers to those questions. If questions are resolved by a contractual change, reference the contract section and make the appropriate change in one of the sections below. Delete this heading and table if not applicable for this Addendum. Be certain to remove this note before final document is printed.]

Q1.	
A1.	
Q2.	
A2.	

Q3.	
A3.	

[NOTE: Under the following sections, include changes to those documents under the heading with this same title found in Document 00010 - Table of Contents, (including changes to previous addenda). Format for revisions provided below. Delete sections if not applicable to this addendum. Be certain to remove this note before final document is printed.]

Bidding Requirements

1. Add the following section(s):

- a. Document, Sec. __, Subparagraph __, Page ____
- b. Document, Sec. __, Subparagraph __, Page ____

[OR]

2. Delete the following section(s):

- a. Document, Sec. __, Subparagraph __, Page ____
- b. Document, Sec. __, Subparagraph __, Page ____

[OR]

3. Delete and replace the following section(s):

- a. Delete Document, Sec. __, Subparagraph __, Page ____ and replace with the following Document, Sec. __, Subparagraph __, Page ____:
- b. Delete Document, Sec. __, Subparagraph __, Page ____ and replace with the following Document, Sec. __, Subparagraph __, Page ____:

Contracting Requirements

1.

2.

Specifications

1.

2.

Drawings:

1.

2.

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.



REQUEST FOR INTERPRETATION

Project Number: 81000819/1712_____

Project Title: Wastewater SCADA System Improvements Phase 2_____

Contractor _____

RFI Number _____ Date _____

From: _____

To: _____

Re: _____

Spec. Sec. Ref:

Paragraph:

Drawing Ref:

Detail:

Signed: _____

Response: _____

Attachments

Response From:

To:

Date Transmitted: _____ Date Rec'd: _____

Signed: _____

Design Professional

Signed: _____

Owner's Representative

- Distribution:
- Owner
 - Contractor
 - Construction Manager
 - Design Professional
 - Consultant _____
 - Other _____



SUPPLEMENTAL DESIGN INSTRUCTION

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

To Contractor _____

From: _____ SDI No _____ Issue Date: _____

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Price or Contract Times. Proceeding with the Work in accordance with these instructions indicates your acknowledgement that there will be no change in the Contract Price or Contract Times.

Description:

Attachments (*List*)

(Signature) Design Professional

Date

- Distribution:
- Owner
 - Contractor
 - Construction Manager
 - Design Professional
 - Consultant _____
 - Other _____



REQUEST FOR PROPOSAL

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

To Contractor _____

From: _____ RFP No _____ Issue Date: _____

Please submit an itemized proposal for changes in the Contract Price and Contract Times for proposed modifications to the Contract Documents described herein. Submit proposal within _____ days, or notify the Owner in writing of the date on which you anticipate submitting your proposal.

This is NOT a Change Order, a Work Change Directive or a direction to proceed with the work described in the proposed modifications.

Description:

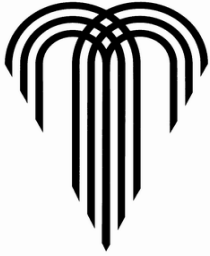
Attachments

Prepared by Design Professional

Prepared by Construction Manager

REQUESTED by OWNER'S Representative

- Distribution: Owner
 Contractor
 Construction Manager
 Design Professional
 Consultant _____
 Other _____



CHANGE ORDER

Project Number 81000819/1712

Project Title Wastewater SCADA System Improvements Phase 2

Change Order No: _____ Date of Issuance: _____

Ordinance No: _____ Ordinance Effective Date: _____
Contract Notice To Proceed Date: _____

To CONTRACTOR:

The Contract is changed as follows: _____

This Change Order constitutes compensation in full on behalf of the Contractor and its subcontractors and suppliers for all costs, including impact costs and extended general conditions, and markups directly and indirectly attributable to the Work changes ordered herein, for all delays related thereto and for performance of the changes within the time stated. Contractor hereby releases all claims for delay, interruption, extended general conditions, impact and cumulative impact claims for this Work.

[**Note:** Identify the specific attachments; example: "Attachment A, Additional Scope of Services." Delete all notes before printing final]

See Attached Document(s).

[**Note:** If the CO does not change the Contract Price, use "Director" instead of "Director of Finance"]

Not valid until signed by the Director of Finance.

The original Contract Price was	\$0.00
---------------------------------	--------

Net change by previously authorized Change Orders	\$0.00
---	--------

The Contract Price prior to this Change Order was	\$0.00
---	--------

The Contract Price will be (<input type="checkbox"/> increased by) (<input type="checkbox"/> decreased by) (<input type="checkbox"/> unchanged)	\$0.00
--	--------

The new Contract Price including this Change Order will be	\$0.00
--	--------

[**Note:** If revised, establish and enter new dates. If unchanged, enter current contract dates.

If you are only changing the Final Completion date, add the following reference: _____

"The Contract Time for Final Completion will be . . .]" _____

The Contract Time will be (<input type="checkbox"/> increased by) (<input type="checkbox"/> decreased by) (<input type="checkbox"/> unchanged)	() calendar days
---	-------------------

The date of Substantial Completion as of the date of this Change Order therefore is	Enter Date
---	------------

The date of Final Completion as of the date of this Change Order therefore is	Enter Date
---	------------

Project No. & Title
Change Order No.

[Note: Include any required additional signatures.]

DESIGN PROFESSIONAL:	By:	Date:
	Title:	
CONTRACTOR:	By:	Date:
	Title:	
CITY:	By:	Date:
	Title:	

Approved as to form: _____
Assistant City Attorney

[Note: If this CO does not change the Contract Price, delete the cert. of funds by Finance Director but send signed copy to Finance.]

I certify there is a balance otherwise unencumbered to the credit of the appropriation to which the above amount is chargeable, and a cash balance otherwise unencumbered in the treasury to the credit of the fund from which payment is to be made, each sufficient to meet the above obligation.

Director of Finance By: _____ Date

- Distribution:
- CITY
 - CONTRACTOR
 - DESIGN PROFESSIONAL

REMINDER: CONTRACTOR is responsible for considering the effect this Change Order may have on its ability to meet or exceed the D/M/WBE participation amounts in its Contractor Utilization Plan (CUP) as amended by any previously approved Request for Modification/Substitution. If CONTRACTOR will not be able to achieve the approved participation amounts in performing the work included within this Change Order, or if CONTRACTOR needs to retain the services of additional D/M/WBEs not previously listed in its CUP, CONTRACTOR is advised to submit a Request for Modification/Substitution.



WORK CHANGE DIRECTIVE

Project Number: 81000819/1712_____

Project Title: Wastewater SCADA System Improvements Phase 2_____

No.: _____ Date of Issuance: _____

TO:
(CONTRACTOR)

You are directed to proceed promptly with the following work:

Description:

Purpose of Work Change Directive:

Attachments: *(List documents supporting change)*

If the above work results on a change in the Contract Price or Contract Times, any request for a Change Order based thereon will involve one or more of the following methods of determining the effect of the change(s).

Method of determining change in
Contract Price:

Method of determining change in
Contract Times:

- Unit Prices
- Lump Sum
- As Stipulated in General Conditions
- Other _____

- CONTRACTOR's Records
- DESIGN PROFESSIONAL's Records
- City's Records
- Other _____

Estimated increase (decrease) in Contract Price:
\$ _____

Estimated increase (decrease) in Contract Times:
Substantial Completion: _____ days;

If the change involves an increase, the estimated
Amount is not to be exceeded without further
authorization.

Final Completion: _____ days.
If the change involves an increase, the estimated times
are not to be exceeded without further authorization.

Recommended:

Recommended:

Recommended:

DESIGN PROFESSIONAL

Construction Manager

City

By (Authorized Signature)

By (Authorized Signature)

By (Authorized Signature)

- Distribution:
- City
 - Contractor
 - Construction Manager

- Design Professional
- Consultant
- Other

WORK CHANGE DIRECTIVE (“WCD”) INSTRUCTIONS

[Note: Do not attach these instructions to the WCD Form]

A. GENERAL INFORMATION

This document was developed for use in situations involving changes in the Work which, if not processed expeditiously, might delay the Project. These changes are often initiated in the field and may affect the Contract Price or the Contract Times. This is not a Change Order, but only a directive to proceed with Work that may be included in a subsequent Change Order. If the WCD may result in an increase in the Contract Price, a contract impact cost analysis must be performed prior to issuing the WCD. Availability of funds and authorization to expend funds must be part of the analysis.

For supplemental instructions and minor changes not involving a possible change in the Contract Price or the Contract Times a Supplemental Design Instruction may be used.

B. COMPLETING THE WORK CHANGE DIRECTIVE FORM

Based on conversations between Design Professional, City’s Representative and CONTRACTOR, Design Professional must complete the following:

DESCRIPTION: shall include a summary of the Work included in the WCD. Additional information may be attached to the WCD to further define the scope.

PURPOSE OF WORK CHANGE DIRECTIVE: will identify clearly if the Work included in the WCD is an addition, deletion, revision, or some combination.

ATTACHMENTS: shall identify all attachments included in and made a part of the WCD. Be certain that attachments are clearly labeled.

METHOD OF DETERMINING CHANGE, IF ANY, IN CONTRACT PRICE: Mark the method to be used in determining the final cost of Work involved and the estimated net effect on the Contract Price. If the change involves an increase in the Contract Price and the estimated amount is approached before the additional or changed Work is completed, another WCD must be issued to change the estimated price. Do not leave blank spaces or write “To be determined” (or “TBD”). An estimated dollar figure must be assigned to the Work. If the WCD is not likely to change the Contract Price, the space for estimated increase (decrease) should be marked “No Change in Price”.

METHOD OF DETERMINING CHANGE, IF ANY, IN CONTRACT TIMES: Mark the method to be used in determining the change in Contract Times and the estimated increase or decrease in Contract Times. If the change involves an increase in the Contract Times and the estimated times are approached before the additional or changed Work is completed, another WCD must be issued to change the times or CONTRACTOR may stop the changed Work when the estimated times are reached. Do not leave blank spaces or write “To be determined” (or “TBD”). If the WCD is not likely to change the Contract Times, the space for estimated increase (decrease) should be marked “No Change in Times”.

Once Design Professional has completed and signed the form, all copies should be sent to CITY for authorization because Design Professional does not have authority to authorize changes in Price or Times. Once authorized by CITY, a copy must be sent by Design Professional to CONTRACTOR. Price and Times may only be changed by Change Order signed by CITY, Design Professional, and CONTRACTOR. If the value of the work included in the WCD exceeds the contingency or budget available for the contract, staff must obtain written approval from the Director or his or her designee before the WCD is issued. A Director or his or her designee may not approve a WCD that will exceed City Council authorization. If the work included in the WCD is needed as a result of an emergency, staff may proceed with the issuance of the WCD without prior written approval even if the value of the work added is expected to exceed the contract contingency balance.

Once the Work covered by this directive is completed or final cost and times are determined. CONTRACTOR must submit proper documentation for inclusion in a Change Order.

IF THIS IS A DIRECTIVE TO PROCEED WITH A CHANGE THAT MAY AFFECT THE CONTRACT PRICE OR THE CONTRACT TIMES A CHANGE ORDER, IF ANY, MUST BE PROCESSED PROMPTLY.

Section 01015 - PROJECT REQUIREMENTS

1. GENERAL DESCRIPTION OF WORK. This section covers the general project requirements for all projects. The work to be performed under these Contract Documents shall be consistent with Section 01100 – Scope of Work in the construction, installation, and completion of all work required in connection with the KCMO SCADA Phase 2 Project, in Kansas City, Missouri. All work should be coordinated with owner and engineer to ensure that correct easements and permits are in place.

2. UNITS OF MEASUREMENT. Not used.

3. OTHER CONSTRUCTION CONTRACTS. There will likely be other construction activities at the sites during the work. Contractor shall coordinate activities when scheduling work.

4. COORDINATION. Contractor shall plan, schedule, and coordinate its operations in a manner which will facilitate the simultaneous progress of the Work under other sections of this Contract and work included under other contracts outside the scope of these Contract Documents.

5. CONTACT WITH OWNER'S PERSONNEL. All contact with Owner's personnel shall be through the Resident Project Representative who will be identified at the preconstruction conference. Contractor shall make all requests for operation changes through the Resident Project Representative .

Contractor shall consider all directions from any of the Owner's personnel, except the Resident Project Representative or City's Project Manager or their designee, to be suggestions.

In an emergency, any responsible personnel may direct Contractor to stop work and leave the work area.

6. WORK BY PUBLIC UTILITIES. Not used.

7. WORK BY OWNER. Not used.

8. ITEMS FURNISHED BY OWNER. OMNI Commander 220-8N antenna to be installed at East Tank Tower.

9. RESPONSIBILITY FOR MATERIALS AND EQUIPMENT.

9.01. Items Furnished by Contractor. Contractor shall be fully responsible for all materials and equipment which it has furnished.

10. OFFSITE STORAGE. Offsite storage arrangements shall be approved by Owner for all materials and equipment not incorporated into the Work but included in Applications for Payment. Such offsite storage arrangements shall be presented in writing and shall afford adequate and satisfactory security and protection. Offsite storage facilities shall be accessible to Owner and Engineer.

11. SUBSTITUTES AND "OR-EQUAL" ITEMS. Provisions for evaluation of substitutes and "or-equal" items of materials and equipment are covered in Paragraph 6.06 of the General Conditions.

Whenever the names of proprietary products or the names of particular manufacturers or vendors are used, it shall be understood that the words "or equal" following the enumeration, if not specifically stated, are implied.

12. PREPARATION FOR SHIPMENT. All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

13. SALVAGE OF MATERIALS AND EQUIPMENT. Refer to the Demolition specification section.

14. LAND FOR CONSTRUCTION PURPOSES. Contractor will be permitted to use available land belonging to Owner, on or near the Site, for construction purposes and for storage of materials and equipment as directed by Owner.

The locations and extent of the areas used shall be acceptable to Owner.

Contractor shall immediately move stored materials or equipment if any occasion arises, as determined by Owner, requiring access to the storage area. Materials or equipment shall not be placed on the property of Owner until Owner has agreed to the location to be used for storage.

15. EASEMENTS AND RIGHTS-OF-WAY. The installation of fiber will be within the public right-of-way as shown on the drawings unless otherwise specified.

Right-of-way permits for work under highways will be coordinated with MODOT and must be obtained within 90 days of work commencing. Contractor will obtain right-of-way permits according to MODOT 7 CSR 10-3. Plans will be presented to MODOT for review prior to obtaining permit. Permits expire after 90 days.

No work may be performed on a levee in the levee right-of-way. All work performed within 300 feet riverside and 500 landside of the levee is considered within the levee critical zone. No work may be performed in a levee critical zone without authorization of Engineer and/or the City. Facilities potentially impacted by levee critical zones are listed below along with the entity that manages the levee.

FACILITY NAME	FACILITY CODE	Levee Unit	Levee Management
NORTH AIRPORT	604	NKC	NKC Levee District
GILLIS	606	East Bottoms	KCMO
LYDIA	607	East Bottoms	KCMO
MILWAUKEE	609	East Bottoms	KCMO
BLUE BANK	612	East Bottoms	KCMO
SOUTH AIRPORT	614	NKC	NKC Levee District

GREGORY RIDGE	618	Swope Park Ind Area	KCMO
SOUTH AIRPORT RELIEF	637	NKC	NKC Levee District
SOUTH AIR PUMPING	676	NKC	NKC Levee District
HARLEM	688	NKC	NKC Levee District
BIRMINGHAM PUMPING	693	Birmingham	Birmingham Drainage District
KEMPER	699	CID	KCMO
BIRMINGHAM WWTP	711	Birmingham	Birmingham Drainage District

The Birmingham WWTF path will require the fiber optic lines to cross the levee maintained by the Birmingham Levee District. All lines crossing the levee must travel overhead and maintain an overhead levee clearance of at least 16 feet. Poles and borings in the levee critical zone must follow the US Army Corps of Engineers Borings, Posts, and Power Poles guidelines.

An easement on private land may be required to cross the levee to the Birmingham WWTF. The contractor shall make sure the city has obtained the proper easement prior to performing any work on private land.

The Birmingham Pumping Station path will require the fiber optic line to cross underneath the Norfolk Southern Railroad. Contractor must follow approved construction drawings and railroad crossing methods as indicated on the Construction Documents. Should Contractor deviate from the approved permitting documents, Contractor will be responsible for all costs and timing issues associated with attaining new permits. No work shall be performed at this location until all permits and easements are obtained by the Engineer and/or the City.

The Birmingham Pumping Station path may require an easement on private land. The contractor shall make sure the city has obtained the proper easement prior to performing any work on private land.

No additional temporary construction easements have been obtained, unless otherwise indicated in the Contract Documents. The Contractor shall set stakes to mark the boundaries of construction easements across each private property. The stakes shall be protected and maintained until completion of the Work. After cleanup has been completed in accordance with Section 01566 – Cleanup Operations, the Contractor shall remove all construction stakes.

The Contractor shall not enter any private property outside the designated construction easement boundaries without written permission from the owner of the property.

Should it become necessary to use or occupy the land beyond the limits of the Site (as defined by Section 00700 – General Conditions), the Contractor shall obtain a written agreement with each affected property owner and tenant. Each agreement shall clearly outline the terms for which the Contractor may utilize the property and shall be fully executed by the Contractor, the property owner and the tenant (when applicable).

Open trenches shall be limited to 100 linear feet in store front areas, 400 linear feet in other commercial areas, and 1000 linear feet in undeveloped areas.

16. POLLUTION CONTROL. The Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris or other substances resulting from the construction activities. No sanitary wastes will be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance will be permitted to enter sanitary sewers and all reasonable measures will be taken to prevent such materials from entering any drain or watercourse.

17. OPERATION OF EXISTING FACILITIES. The existing treatment plants and pumping stations must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from Owner in advance, in accordance with the Operational Change Control Plan (OCCP), portions of the existing facilities may be taken out of service for short periods as noted in the Construction and Schedule Requirements paragraph..

Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities and processes in full operation during the construction period, except as noted in the Construction and Schedule Requirements paragraph.

18. CONSTRUCTION AND SCHEDULE REQUIREMENTS. The following requirements shall be taken into consideration in preparing the Work Plan and proposed schedule of construction operations. For purposes of the schedule considerations and sequencing listed below, the following definition applies:

Shutdown – Maximum length of shutdown for existing treatment plant shall not exceed 1 hour from start of shutdown to end of shutdown as noted below. Contractor to provide temporary protections for shutdowns longer than 1-hour in duration. Shutdowns shall meet the requirements of the Connections to Existing Facilities paragraph including 7-day advance notice for permission from Owner and meeting with Owner and Engineer to plan the shutdown.

- a. Work associated with removing cables or equipment shall not commence until the new cables, equipment, and appurtenances arrive onsite and have been inspected, except for preparatory tasks.
- b. Contractor Work Plan shall incorporate the commissioning schedule.
- c. No shutdowns on consecutive days. Shutdowns on Tuesdays, Wednesdays or Thursdays are preferred. Shutdowns shall occur during weekdays and during the daytime, unless otherwise approved by the Owner. No shutdowns or equipment startups will be allowed on weekends, holidays, or Fridays unless approved by the Owner.
- d. Contractor shall be responsible for any damage caused by improperly supported structures, supports and restraints.
- e. Un-planned plant maintenance or treatment upset could delay Contractor's progress up to two (2) weeks. Contractor will be required to make up any lost time if critical to completion of the Work and shall include these two weeks allowance in the baseline schedule.
- f. Work may be necessary during cold, hot, or inclement weather. Refer to the Construction Progress Documentation specification for additional requirements.
- g. Connections to existing SCADA Radio and Antenna, CCTV cameras, electrical boxes, fiber boxes, and associated cables shall be sequenced per reference in the Instrumentation and Control System specification section.

19. PROPOSED CONSTRUCTION SEQUENCE. Wastewater treatment plants and pumping stations must be kept in continuous operation throughout the construction period. Limited interruptions will be permitted which adversely affect the degree of service provided. Provided permission is obtained from Owner in advance, portion of the existing facilities may be taken out of service for short periods corresponding with periods of minimal service demands.

The following information provides a suggested sequence for construction operations that shall be taken into consideration in preparing the Work Plan and proposed schedule of construction operations. Other sequences proposed by Contractor will be considered. The sequence may require multiple crews working at the same time on multiple tasks. Variations from this sequence will only be reviewed after award of contract has been made. The proposed sequence of construction involves the following based on order of facilities:

Construction sequencing is anticipated to be divided into four different work packages based on location and on similar construction activities.

Work Package 1 - North, NW
Radio Sites - Connect to N. Oak
WILDWOOD WEST SANITARY STATION (FACILITY 642)
KCI INDUSTRIAL SANITARY STATION (FACILITY 643)
NORTHLAND MOBILE SANITARY STATION (FACILITY 657)
Fiber Sites
WHITE ALOE SANITARY STATION (FACILITY 684)
MACE ROAD SANITARY STATION (FACILITY 694)
WEATHERBY LAKE SANITARY STATION (FACILITY 696)
UPPER RUSH SANITARY STATION (FACILITY 687)
KCI DE-ICING FLOOD STATION (FACILITY 745)

Work Package 2 - East, NE
East Tank - fiber, radio, PLC
RIVERSIDE HORIZONS SANITARY STATION (FACILITY 662)
TRUMAN FLOOD STATION (FACILITY 610)

Work Package 2 - East, NE
HAWTHORN FLOOD STATION (FACILITY 611)
12TH STREET SANITARY STATION (FACILITY 667)
NORTH CHURCH ESTATES SANITARY STATION (FACILITY 619)
BROADWAY FLOOD STATION (FACILITY 603)
PROSPECT FLOOD STATION (FACILITY 608)
Fiber Sites
EAST TANK (FACILITY 848)
BIRMINGHAM WWTP (FACILITY 711)
BIRMINGHAM SANITARY STATION (FACILITY 693)
MILWAUKEE FLOOD STATION (FACILITY 609)
CHOUTEAU SANITARY STATION (FACILITY 659)
BLUE BANK FLOOD STATION (FACILITY 612)
BRUSH CREEK SANITARY STATION (FACILITY 686)

Work Package 3 - Central
Fiber Sites
PLATTE WOODS SANITARY STATION (FACILITY 697)
LAKE WAUKOMIS SANITARY STATION (FACILITY 682)
BRIARCLIFF WEST SANITARY STATION (FACILITY 646)
NORTH AIRPORT FLOOD STATION (FACILITY 604)
SOUTH AIRPORT RELIEF FLOOD STATION (FACILITY 637)

Work Package 3 - Central
SOUTH AIRPORT FLOOD STATION (FACILITY 614)
SOUTH AIRPORT SANITARY STATION (FACILITY 678)
HARLEM SANITARY STATION (FACILITY 688)
KEMPER FLOOD STATION (FACILITY 699)
25TH STREET FLOOD STATION (FACILITY 601)
SOUTHWEST BOULEVARD SANITARY AND FLOOD STATION (FACILITY 600)
BIRCHWOOD SANITARY STATION (FACILITY 663)
118TH AND LAWNSDALE SANITARY STATION (FACILITY 677)
83RD STREET SANITARY STATION (FACILITY 692)
GREGORY RIDGE SANITARY STATION (FACILITY 664)
FUTURE FIBER
GILLIS FLOOD STATION (FACILITY 606)
LYDIA FLOOD STATION (FACILITY 607)

Work Package 4 - Non SCADA and Todd Creek
Control Room Mods
Birmingham WWTP (Facility 711)
Rocky Branch WWTP (Facility 718)
Fishing River WWTP (Facility 720)
Westside WWTP (Facility 712)
Fiber Sites

Contractor shall refer to the specifications and Drawings for the scope of work required to be performed at each site.

20. NOTICES TO OWNERS AND AUTHORITIES. Contractor shall, as provided in the General Conditions, notify owners of adjacent property and utilities when execution of the Work may affect them.

When it is necessary to temporarily deny access to property, or when any utility service connection must be interrupted, Contractor shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

Utilities and other concerned agencies shall be notified at least 24 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

21. LINES AND GRADES. All Work shall be done to the lines, grades, and elevations indicated on the Contract Drawings.

All survey, layout, and measurement work shall be performed by Contractor as a part of the Work.

Contractor shall provide an experienced instrument person, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement work. In addition, Contractor shall furnish, without charge, competent persons and such tools, stakes, and other materials as Engineer may require in establishing or designating control points, in establishing construction easement boundaries, or in checking survey, layout, and measurement work performed by Contractor.

Contractor shall keep Engineer informed, a reasonable time in advance, of the times and places at which it wishes to do Work, so that horizontal and vertical control points may be established and any checking deemed necessary by Engineer may be done with minimum inconvenience to Engineer and minimum delay to Contractor.

Contractor shall remove and reconstruct work which is improperly located.

22. ALLOWANCES. Allowance No. 1 is included to cover unknown hazardous conditions, hardware and programming additions, licensing additions, and unknown conditions that may be requested by the Owner. See Section 01210 for further description. Allowance No. 2 is included to cover prenegotiated Rockwell Software purchases from Rensenshouse.

23. CONNECTIONS TO EXISTING FACILITIES. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor

shall receive permission from Owner or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time.

24. UNFAVORABLE CONSTRUCTION CONDITIONS. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall confine its operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the Work in a proper and satisfactory manner.

25. CUTTING AND PATCHING. As provided in General Conditions, Contractor shall perform all cutting and patching required for the Work and as may be necessary in connection with uncovering Work for inspection or for the correction of defective Work.

Contractor shall perform all cutting and patching required for and in connection with the Work, including but not limited to the following:

- Removal of improperly timed Work.

- Removal of samples of installed materials for testing.

- Alteration of existing facilities.

- Installation of new Work in existing facilities.

Contractor shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. Contractor shall not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without Engineer's concurrence.

Materials shall be cut and removed to the extent indicated on the Contract Drawings or as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. Materials which are not salvable shall be removed from the site by Contractor.

All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to Engineer, to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

26. HAZARDOUS ENVIRONMENTAL CONDITIONS AT SITE.

26.01. Potential Asbestos Containing Materials (PACM). Owner has completed an asbestos survey of facilities on the Site. No asbestos containing materials (ACM) were identified in areas potentially affected by the Work. The asbestos survey reports are listed in Paragraph SC-5.06.

Paragraph 4.06 of the Construction General Conditions addresses procedures to be followed if Contaminated Environmental Media and Hazardous Substances are encountered on the site.

26.02. Metal Bearing Paint, Protective Coatings, and Liners. Owner has completed a survey of facilities on the Site. No paint, protective coatings, or liners were identified as containing detectable quantities of lead, chromium, or other heavy metals in areas potentially affected by the Work. The paint, protective coatings, and liners survey report is listed in Paragraph SC-5.06. The terms liners and linings are interchangeable and shall have the same meanings in the contract documents. Paragraph 4.06 of the Construction General Conditions addresses procedures to be followed if Contaminated Environmental Media and Hazardous Substances are encountered on the site.

26.03. Contaminated Environmental Media and Hazardous Substances. Owner has completed an assessment of the Site. No Contaminated Environmental Media or Hazardous Substances were identified in areas potentially affected by the Work. However, Contractor shall notify Owner if asbestos are uncovered. Owner shall be responsible for testing and remediation – see section 01354 Hazardous Material Procedures. Paragraph 4.06 of the Construction General Conditions addresses procedures to be followed if Contaminated Environmental Media and Hazardous Substances are encountered on the site. The Contaminated Environmental Media and Hazardous Substances assessment report is listed in Paragraph SC-5.06.

27. CLEANING UP. Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. Contractor shall provide adequate trash receptacles about the Site and shall promptly empty the containers when filled.

Construction materials, such as concrete forms and scaffolding, shall be neatly stacked by Contractor when not in use. Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.

Volatile wastes shall be properly stored in covered metal containers and removed daily.

Wastes shall not be buried or burned on the Site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the Site and disposed of in a manner complying with local ordinances and antipollution laws.

Adequate cleanup will be a condition for recommendation of progress payment applications.

For additional waste management requirements, refer to the Construction Waste Management and Disposal section.

28. APPLICABLE CODES. References in the Contract Documents to local codes mean the following:

- International Building Code (IBC), 2015 Edition
- Uniform Mechanical Code (UMC), 2015 Edition
- Uniform Plumbing Code (UPC), 2015 Edition
- International Fire Code (IFC), 2015 Edition

International Energy Conservation Code (IECC), 2015 Edition

National Electrical Code (NEC), 2014 Edition

Recommended Standards for Wastewater Works – GLUMRB (10 states), 2014 Edition

National Fire Protection Association, Fire Protection in Wastewater Treatment Facilities (NFPA 820), 2016 Edition

Other standard codes which apply to the Work are designated in the Specifications.

29. REFERENCE STANDARDS. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or laws or regulations in effect at the time of opening of Bids (or on the effective date of the Contract or Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents. However, no provision of any referenced standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to Owner, Engineer, or any of Engineer's Consultants, agents, or employees, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

30. PROGRESS MEETINGS. Contractor shall be responsible for conducting a preconstruction conference, weekly coordination meetings, monthly progress meetings, and other work planning meetings as outlined in the Project Management and Coordination specification section.

Contractor shall preside at the meetings. Meeting minutes shall be prepared and distributed by Contractor. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

31. SITE ADMINISTRATION. Contractor shall be responsible for all areas of the Site used by it and by all Subcontractors in the performance of the Work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to Owner or others. Contractor shall have the right to exclude from the Site all persons who have no purpose related to the Work or its inspection, and may require all persons on the Site (except Owner's employees) to observe the same regulations as Contractor requires of its employees.

32. COMMUNICATION PLAN. Prior to starting any work at the site, Contractor shall prepare a Communication Plan and submit the plan to the Owner for review and coordination. The plan shall include, but not be limited to, a listing of all Contractor, Subcontractor, Owner and Engineer contacts and shall indicate primary and backup contacts. A copy of the final plan shall be distributed to all parties listed above and updated as needed.

33. PROJECT SAFETY PLAN. The Contractor shall be responsible for safety as described in the General Conditions.

34. DEWATERING PLAN. Not Used.

35. WORK PLAN. 30 days prior to starting any work at any site, Contractor shall prepare and submit a Work Plan. The Work Plan shall cover all major aspects of the construction, including but not limited to, sequencing, detailed outage plan, equipment to be used, and backup and contingency plans for out-of-service equipment. The Work Plan shall reference the Communication, Dewatering, and Safety Plans described above. No work may begin at the site until the Work Plan submittal has been accepted. Refer to the Construction Progress Documentation specification section for requirements for the construction schedule submittals.

36. FIBER BACKBONE CONSTRUCTION REQUIREMENTS. Construction of new backbone fiber and connection to existing City of Kansas City, Missouri and Unite Private Networks (UPN) fiber shall conform to City of Kansas City, Missouri requirements. Fiber installation shall be in accordance with the Public Works Design and Construction Standards which are hereby included by reference. The latest edition can be found at the City website <https://www.kcmo.gov/city-hall/departments/public-works>.

Specific Items referenced include the following:

<https://www.kcmo.gov/city-hall/departments/public-works/traffic-signal-specifications-and-drawings>:

- Sheet TCD-0-6 Pull Box, Junction Boxes, and Conduit Markers
- Sheet TCD-06A Pull Box, Junction Boxes, and Conduit Markers
- TSP [Technical Special Provisions]

<https://www.kcmo.gov/city-hall/departments/public-works/standard-drawings>

- Sheets SR-1 Street Cut Restoration Details

Fiber splices made to existing UPN fiber is the responsibility of the Contractor. UPN shall be contacted 30-days in advance that a splice to their network is required. Contractor shall be responsible for scheduling the connection and compensating UPN for their work.

The Contractor shall replace all surface material and shall restore all paving, curbs, gutters, sidewalks, driveways, shrubbery, fences, sod and all other features disturbed to a condition of equal to or better than before the work began, furnishing all material, labor and equipment incidental thereto. Additional requirements for Fiber Installation are included in Section 01500.

End of Section

SECTION 01019 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Section 00700 – General Conditions.
 - 2. Section 01020 – Record Documents.
 - 3. Section 01021 – Operation and Maintenance Data.
 - 4. Section 01140 – Work Restrictions.
 - 5. Section 01140.01 - Process and System Shutdown Constraints Schedule.
 - 6. Section 01140.02 - Operation Change Control Plan Documents.
 - 7. Section 01300 – Submittals.
 - 8. Section 01320 – Construction Progress Documentation.
 - 9. Section 01322 – Photographic Documentation
 - 10. Section 01335 – Document Management.
 - 11. Section 01340 – Building Information Modeling (BIM)

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Submittals.
 - 3. Final cleaning.

1.03 SUBMITTALS

- A. All Substantial Completion documents shall be submitted at least 14 calendar days prior to Substantial Completion inspection request.
 - 1. Specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 2. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 3. Prepare and submit Project Record Documents, final operation and maintenance manuals, Record Documents, damage or settlement surveys, property surveys, and similar final record information.
 - 4. Submit specific warranties, workmanship bonds, maintenance service agreements, and similar documents in accordance with this Section.
 - 5. Submit all manufacturers' certificates in accordance with Section 01433 Manufacturers' Field Services
 - 6. Submit Final Original Equipment Manufacturer Operations & Maintenance (OEM O&M) Manuals for all equipment and materials furnished as part of the Work of the Project.
 - 7. Prepare and submit draft Facility O&M Data and the draft Electronic O&M Manual in accordance with the requirements of this Section.
 - 8. Submit draft as-built BIM developed in accordance with Section 01340 Building Information Modeling Requirements and updated to include as-built conditions.

- B. All Final Completion documents shall be submitted at least 14 calendar days prior to Final Completion inspection request. Before requesting a final inspection to determine the date of Final Completion, complete the following:
1. Submit a certified copy of the City's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the City. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Final operations and maintenance manuals must be provided for the training sessions.
 4. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects. Surfaces which cannot be touched-up or repaired satisfactorily, shall be refinished or replaced.
 5. Submit changeover information related to Owner's use, operation, and maintenance.
 6. Submit final O&M Data, including the final electronic O&M in accordance with the requirements of this Section.
 7. Submit Final Building Information Model incorporating all as-built information in accordance with Section 01340 Building Information Modeling Requirements.
 8. A written request for final inspection for acceptance requirements.
 9. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."

1.04 WARRANTIES

- A. Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Use: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and used by Owner during construction period by separate agreement with Contractor or Design-Builder.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor or Design-Builder.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.
- E. Provide additional copies of each warranty as a separate pdf file.
- F. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1.05 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining the date of Substantial Completion, the Contractor or Design-Builder shall comply with all conditions in Supplementary Conditions and complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 2. Deliver salvaged material and similar items in accordance with Section 01352 Selective Alterations and Demolition to location designated by the Owner. Label with manufacturer's name and model number where applicable.
 3. Clean the project area of construction debris and other construction effects.
 4. Terminate and remove temporary facilities from the Project site, along with mockups, construction tools, and similar elements.
 5. Complete final cleaning requirements, including touchup painting.
 6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 7. Prepare and submit all required Submittals as specified herein.
- B. Inspection: Submit a written request for Substantial Completion inspection. On receipt of request, the Engineer will either proceed with inspection or notify Contractor or Design-Builder of unfulfilled requirements. The Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor or Design-Builder of items, either on Contractor or Design-Builder's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Substantial Completion.
 3. The Contractor or Design-Builder shall pay for any re-inspection other than the first re-inspection. The costs of all extra re-inspections, including the cost of the Owner's Representative and the Engineer will be deducted from the Contractor or Design-Builder's payments.
 4. Following completion of all items above and all requirements for Substantial Completion included in the Supplemental Conditions 008000, the Owner will complete Form 01290.2 Certificate of Substantial Completion and distribute to the Contractor or Design-Builder.

1.06 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining the date of Final Completion, complete the following:
1. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Final operations and maintenance manuals must be provided for the training sessions.
 2. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects. Surfaces which cannot be touched-up or repaired satisfactorily, shall be refinished or replaced.
 3. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects. Surfaces which cannot be touched-up or repaired satisfactorily, shall be refinished or replaced.
 4. Prepare and submit all required Submittals as specified herein.
- B. A written request for final inspection for acceptance must be provided to the Engineer. Upon receipt of request, Engineer will either proceed with inspection or notify Contractor or Design-Builder of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor or Design-Builder of construction that must be completed or corrected before certificate will be issued.
1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected. The Contractor or Design-Builder shall pay for any re-

- inspection other than the first re-inspection. The costs of all extra re-inspections, including the cost of the Owner's Representative and the Design Professional deducted from the Contractor or Design-Builder's payments.
2. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."

1.07 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Contractor or Design-Builder shall prepare and submit three copies of punch list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor or Design-Builder that are outside the limits of construction. The Contractor or Design-Builder shall use the standard Water Services form for all items.
 1. Organize a list of spaces in sequential order,
 2. Organize items applying to each space by major element, including category equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project Number
 - b. Project name.
 - c. Date.
 - d. Name of Contractor or Design-Builder.
 - e. Page number.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with the manufacturer's written instructions.
- C. Complete the following cleaning operations before requesting inspection for certification of Final Completion for entire Project or for a portion of Project:
 1. Clean Project site and grounds, in areas disturbed by construction activities, of rubbish, waste material, litter, and other foreign substances.
 2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 3. Remove tools, construction equipment, machinery, and surplus material from the Project site.
 4. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
 5. Sweep concrete floors broom clean in unoccupied spaces.
 6. Remove labels that are not permanent.
 7. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already shows evidence of repair or restoration.
- D. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 1. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 2. Clean ducts and blowers if units were operated without filters during construction.

3. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 4. Leave Project clean and ready for use.
- E. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Project site and dispose of lawfully.

END OF SECTION

SECTION 01020 – RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Contractor shall maintain, in a safe place at the Site, one updated record copy of all Drawings, Standards and Specifications, Addenda, Shop Drawings, Requests for Interpretation (RFIs), Requests for Proposal (RFPs), Work Change Directives (WCDs), Change Orders, other written interpretations or clarifications of the contract documents, survey information (including approved cut sheets) and all other documents relevant to the Work.
- B. All such documents shall be kept in order, good condition and shall be continuously updated to indicate all work installed and all changes made during construction.
- C. No work shall be allowed in the absence of these record documents.
- D. This document also outlines electronic data requirements and defines the survey requirements for the development of Field-Marked Drawings, As-Built Drawings and Conforming to Construction Drawings.

1.02 RELATED SECTIONS

- A. Section 00700 – General Conditions.
- B. Section 01019 – Closeout Procedures.
- C. Section 01020 – Record Documents.
- D. Section 01021 – Operation and Maintenance Data.
- E. Section 01140 – Work Restrictions.
- F. Section 01140.01 - Process and System Shutdown Constraints Schedule.
- G. Section 01140.02 - Operation Change Control Plan Documents.
- H. Section 01300 – Submittals.
- I. Section 01320 – Construction Progress Documentation.
- J. Section 01335 – Document Management.
- K. Section 01380 – Photographic Documentation.

1.03 CODES AND STANDARDS

- A. CAD Standards – KC Water CAD Standards.

1.04 DEFINITIONS

- A. Drawings – As defined by Section 00700 – General Conditions.
- B. Approved for Construction Drawings – Any drawing or sketch that has been issued to the Contractor or Design-Builder by the City for the purposes of constructing the Work. These include, but are not limited to, the following: Drawings, revisions to the Drawings, information issued as part of change orders and information issued as part of work change directives.
- C. Field-Marked Drawings (Red Line Markups) – A copy of the Approved for Construction Drawings that is maintained and updated daily by the Contractor or Design-Builder during construction clearly detailing all work completed and depicting all changes made to the Work during construction.
- D. As-Built Drawings – The completed Field-Marked Drawings that include the signed certification language from both the Contractor or Design-Builder and Surveyor.

- E. Conforming to Construction Drawings – The Approved for Construction Drawings that have been revised to reflect the changes noted on the As-Built Drawings. For these drawings, the CAD files are updated, revision block is updated, and a new set of drawings is created.
- F. Record Model – The building information model (BIM) that documents the work completed.
- G. Record Drawings – All drawings used or developed as part of the Work. Record Drawings include, but are not limited to, the following: Approved for Construction Drawings, Field-Marked Drawings, As-Built Drawings and Conforming to Construction Drawings.
- H. Record GIS – GIS files containing the site piping work completed in this project that has been created per KC Water Standards.
- I. Record Documents – As defined by this Section, Section 01015 and Section 00700 – General Conditions, Article 6 Contractor or Design-Builder’s Responsibilities including but not limited to updated BIM, Electronic O&M Manual, OEM O&M, Record Photos, Final Submittals, SOPs, SIs, and any other specified submittals.

1.05 INFORMATION PROVIDED BY THE CITY

- A. The City will provide the Contractor or Design-Builder a border template to be used for all issued Construction Drawings in an electronic/CAD format.

1.06 SUBMITTALS

- A. Submit as specified in Section 01300 – Submittals.
- B. Warranties and Bonds.
- C. For each item of material or equipment furnished under the Contract.
- D. Submittals include, but are not limited to, the following:
 - 1. Warranties as specified herein.
 - 2. As-Built Drawings.
 - 3. Conforming to Construction Drawings.
 - 4. Electronic Submittals:
 - 5. All electronic deliverables (drawings, coordinates table, etc.) shall be made through the approved document management system. See Section 01335 – Document Management.
 - 6. As-Built Drawings:
 - a. One (1) hard copy on paper for review and approval.
 - b. One (1) electronic copy in PDF format.
 - a. One (1) electronic copy in the latest version of AutoCAD® .dwg format.
 - 7. Conforming to Construction Drawings:
 - a. One (1) signed, sealed and certified hard copy on Mylar or Vellum.
 - b. One (1) signed, sealed and certified hard copy on paper.
 - c. One (1) signed, sealed and certified electronic copy in PDF format.
 - d. One (1) signed, sealed and certified electronic copy in the latest version of AutoCAD® .dwg format.
 - 8. All Record Documents including those listed in the referenced Sections:
 - a. Submit Record documents in accordance with Section 00700 – General Conditions, Article 14 – Payments to the Contractor or Design-Builder and Completion.
 - b. The following shall be submitted for Record Documents:

- i. **One (1) hard copy on paper.**
- ii. **One (1) electronic copy in PDF format.**
- iii. **As specified in other sections.**
- iv. **Electronic (PDF) Documents:**
 - v. **Documents shall be full scale.**
 - vi. **Markups shall be noted in RED.**
 - vii. **Minimum resolution shall be 600 dpi.**

1.07 WARRANTY

- A. Warranties and Bond are Record Documents.**
- B. CITY has the right to reject warranties.**
- C. CITY reserves the right to reject Work for the Project if the required warranties have not been provided.
- D. Submit form of manufacturer's warranty prior to fabrication and shipment of the item from the manufacturer's facility.**
- E. Submit form of manufacturer's special warranty when specified.
- F. Provide consolidated warranties and bonds within 15 calendar days of Substantial Completion.
- G. Contents:
 - 1. Organize warranty and bond documents:
 - 2. Include Table of Contents organized by specification section number and the name of the product or work item.
 - 3. Include each required warranty and bond in proper form, with full information, are certified manufacturer as required, and are properly executed by Contractor, or subcontractor, supplier, or manufacturer.
 - 4. Provide name, address, phone number, and point of contact of manufacturer, supplier, and installer, as applicable.
- H. Warranty submittal format:
 - 1. Submit two (2) hardcopies.
 - 2. Hardcopies shall be assembled in 3 D-side ring binders with durable cover.
 - 3. Identify each binder on the front and spine clearly labeling the following:
 - a. Warranties and Bonds.
 - b. Project Name or Title.
 - c. Name, Address, and Telephone Number of the Contractor.
 - 4. Submit one (1) electronic copy in PDF format.
 - 5. The Record Documents shall be an integral part of the work guaranteed by the Contractor or Design-Builder's Performance and Maintenance Bond. If during the three-year maintenance period the City determines that further revisions or corrections are necessary to make the Record Documents accurate, the Contractor or Design-Builder shall make or cause the revisions or corrections to be made at no additional cost to the City.**

1.08 QUALITY ASSURANCE

- A. The Contractor or Design-Builder is responsible for the quality assurance and quality control of the Work.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.01 SURVEY REQUIREMENTS

- A. All field books, notes, videotapes and other data developed by the Contractor or Design-Builder in performing required surveys as part of the Work shall be available to the City for examination throughout the construction period. All such data shall be submitted to the City with the other documentation required for final acceptance of the Work.
- B. General Requirements:
 - 1. The Contractor or Design-Builder shall provide survey grade information for the locations and elevations of the Work as described herein. Surveys shall be conducted by a Professional Land Surveyor, licensed in the State of Missouri.
 - 2. Vertical Datum – All elevations shall be indicated in North American Vertical Datum of 1988 (NAVD 88) in feet and decimals of a foot.
 - 3. Horizontal Control – Coordinates shall be referenced to the North American Datum of 1983 (NAD 83), State Plane Missouri West Zone FIPS 2403 US Feet coordinate system, Kansas City Metro Control. Statewide Missouri Geographical Reference System monuments, Project monuments and Certified Land corners shall be used as references to determine State Plane coordinates. All control monuments used in the survey work shall be listed with reference ties and shown on the Record Drawings.
 - 4. Water Systems:
 - a. Fire Hydrant Assemblies – Provide survey point (location and elevation) at the top of the operating nut for each fire hydrant.
 - b. Fittings – Provide survey point (location and elevation) at the center of each fitting (i.e. bends, tees, valves, etc.). Survey shall be taken at the top of the fitting. Provide the elevation of finished grade or improvements at the top of the fitting.
 - c. Pipe Profile – Provide survey points (location and elevation) at the center point of all piping at a maximum spacing of 50 feet. Survey shall be taken on the top of the pipe. At the same location, provide the elevation of finished grade.
 - d. Valves, Valve Vaults, Meter pits and Other Structures – A survey is required to verify the location of all new valves, valve vaults, meter pits or other structures. The survey shall include, but is not limited to, the following:
 - (i) Location of the Structure – Provide coordinates for the center of the access cover.**
 - (ii) Top elevation – Provide the top elevation of the structure at the center of the access cover.**
 - 5. Wastewater Systems:
 - a. Location – Verify the “Locating Point” shown on the Approved for Construction Drawings or standard detail. Verify all coordinate data shown on the Approved for Construction

- Drawings. If no such information is provided, the Locating Point shall be the center of the manhole cover.
- b. Top Elevation. – Provide the elevation of the top of the structure at the Locating Point.
 - c. Pipe Inverts – Provide the invert elevation and flow direction of all pipes that penetrate the structure (flowline in - FL IN) and exit the structure (flowline out - FL OUT).
 - d. Manhole Invert – Provide the elevation of the invert at the center of the manhole if different than the pipe inverts.
6. Existing Manholes – A survey is required to verify the location of all existing manholes that are modified as part of the Work. The survey shall include, but is not limited to, the following:
- a. Location of the Structure – Verify the “Locating Point” shown on the Approved for Construction Drawings or standard detail. Verify all coordinate data shown on the Approved for Construction Drawings. If no such information is provided, the Location Point shall be the center of the manhole cover.
 - b. Top Elevation – Provide the elevation of the top of the structure at the Locating Point.
 - c. Pipe Inverts – Provide the invert elevation and flow direction of all pipes that penetrate the structure (flowline in - FL IN) and exit the structure (flowline out - FL OUT).
 - d. Manhole Invert – Provide the elevation of the invert at the center of the manhole if different from the pipe inverts.
7. Storm Water and Green Infrastructure Systems
- a. A survey is required to verify the location of all new Green Infrastructure, Storm Water Structures, Junction Boxes, Manholes, Inlets and all other related structures. The survey shall include, but is not limited to, the following:
 - b. Location of the Structure – Verify the Locating Point shown on the Approved for Construction Drawings or standard detail. Verify all coordinate data shown on the Approved for Construction Drawings. The locating point for curb inlets is center of inside face of inlet wall. If no other locating information is provided for other structures, the Locating Point shall be the center of the access cover.
 - c. Top Elevation – Provide the elevation of the top of the structure at the Locating Point.
 - d. Pipe Inverts – Provide the invert elevation and flow direction of all pipes that penetrate the structure (flowline in - FL IN) and exit the structure (flowline out - FL OUT).
 - e. Manhole or Structure Invert – Provide the elevation of the invert at the center of the manhole or structure if different than the pipe inverts.
8. Culvert - A survey is required to verify the location of new culverts. The survey shall include, but is not limited to, the following:
- a. Location – The Locating Points shall be the center line of each culvert barrel at the upstream and downstream end of each. The location of each culvert barrel is to be provided.
 - b. Invert – Provide the upstream and downstream invert elevation of each culvert barrel.
9. Channels and Ditches:
- a. Profile – Provide survey points (location and elevation) at the upstream and downstream end of the channel and along the channel at a maximum 50-foot intervals and at all bends and changes in alignment.
 - b. Survey points shall be taken at finished grade at the centerline, toes of side slopes or walls and top elevation of the high flow channel on both sides of the channel. If water is present in the channel or ditch, provide water surface elevation on both sides of the channel.

10. Detention Areas:

- a. For any surface feature designed to detain or retain storm water runoff (i.e., detention basins, rain gardens, bio-retention cells, etc.) an as-built survey of the feature is required.
 - b. Enough survey points shall be taken to generate 1-foot contours of the detention or retention area and any containment berms.
 - c. Provide survey points (location and elevation) for both ends of weirs, all weir high and low points (if top of weir is not level) and other flow control structures, inlets and outlets.
 - d. Provide survey points (location and elevation) for both ends of weirs and all weir high and low points (if top of weir is not level) of the principal spillway structure.
11. Facility Site Assets:
- a. Site Assets shall be documented to the same level of detail as other assets (water, wastewater etc..).
 - b. Assets include all buried infrastructure in the project including but not limited to ductbanks, conduit, chemical piping, casings, gravity sewers, process piping, etc.

3.02 FIELD-MARKED DRAWINGS

- A. The Contractor or Design-Builder shall continuously maintain a set of Field-Marked Drawings which details all work completed and shows all changes or deviations made by the Contractor or Design-Builder from the Approved for Construction Drawings. Where the Approved for Construction Drawings are not detailed and allow for flexibility during construction, the Contractor or Design-Builder shall include the detailed information on how the Work was constructed. These adjustments shall include, but are not limited to, field adjustments and change orders.
- B. Field-Marked Drawings shall be prepared using survey grade information to show the horizontal and vertical location of the Work after completion of construction. Connection details may be sketched using field run measurements.
- C. Mark new information that is not shown on Drawings or Shop Drawings.
- D. Include the following:
 - a. Field changes of dimension and detail.
 - b. Change Order modification. Note related Change Order numbers where applicable.
 - c. RFI modification. Note related RFI numbers where applicable.
 - d. Details not on original Drawings.
 - e. Horizontal and vertical location of all underground utilities and all other concealed elements that would be difficult or costly to maintain the installed asset long term.
- E. Precision of Measurement:
 - a. Where survey measurements are not required (sketching connection details) – elevations, stationing, distances and measurements shall be expressed to the nearest 0.10 foot.
 - b. All other Work requires survey information – elevations, station, distances and measurements shall be expressed to the nearest 0.01 foot.
 - c. Field changes or additions shall be designated in RED. Hard copy and electronic (PDF) deliverables shall be provided in color.
 - d. Information shall be clearly distinguishable on hard copy mark-ups and in the electronic files.
- F. If the Contractor or Design-Builder observes inaccurate information pertaining to existing conditions, the correct information shall be noted in the Field-Marked Drawings.**
- G. The Contractor or Design-Builder shall submit 30%, 60% and 90% check prints with the corresponding percent complete of work. The check prints shall be submitted with the Application

for Payment. Failure to provide the check prints shall cause the Application for Payment to be returned to the Contractor or Design-Builder.

3.03 AS-BUILT DRAWINGS

A. Upon completion of the Work and before the Application for Final Payment, the Contractor or Design-Builder shall prepare the As-Built Drawings by completing annotations to the Field-Marked Drawings and adding the required certification statements.

B. Surveyor's Certification:

1. Each drawing shall be modified to include a certification statement and signature block as described below.

a. Water Systems

Each sheet of these Record Drawings and attached Survey Cut Sheets for the Work have been reviewed and approved by the Professional Land Surveyor whose seal is affixed to this Record. The horizontal control, coordinates and elevations shown on these Records are accurate and are based on the Missouri Coordinate System of 1983, West Zone and NAVD88 datum, with the date of adjustment. These Records have been revised, as required in Section 01000, 1.20 of the Standards and Specifications for Water Main Extensions and Relocations, under my personal supervision to show the true and accurate measurements of the work as it was actually constructed.

b. Wastewater, Storm Water and Green Infrastructure Systems

Each sheet of these Record Drawings, Record Models and attached Survey Cut Sheets for the Work have been reviewed and approved by the Professional Land Surveyor whose seal is affixed to this Record. The horizontal control coordinates and elevations shown on these Records are accurate and are based on the Missouri Coordinate System of 1983, West Zone and NAVD88 Datum. These Records have been revised under my personal supervision to show the true and accurate measurements of the work as it was actually constructed.

2. Every sheet of the Field-Marked Drawings must be reviewed, signed and sealed by a Professional Land Surveyor, licensed in the State of Missouri and must include the following statement on the title block inside the box marked "for WSD use" and near the Surveyor's professional license seal.

C. Contractor's Certification:

1. Each drawing shall be modified to include a certification statement and signature block as described below:

Water Systems

I hereby certify that this Record correctly depicts the Work constructed as to size, material, horizontal location, vertical location and finished grade as shown on the approved construction drawings or their revision. The Work was done in accordance with these Records and the current version of the Standards and Specifications for Water Main Extensions and Relocations.

Contractor: _____ Date: _____

Name _____ Title: _____
(print): _____
Signature: _____

Wastewater, Storm Water and Green Infrastructure Systems

I hereby certify that this Record correctly depicts the Work constructed as to size, material, horizontal location, vertical location, grade of installed piping systems and finished grade as shown on the approved construction drawings or their revision. The Work was done in accordance with these Records.

Contractor: _____ Date: _____
Name _____ Title: _____
(print): _____
Signature: _____

- a. **The Contractor or Design-Builder shall provide certification that the Field-Marked Drawings reflect the conditions that were constructed.**
- b. **The Contractor or Design-Builder shall review the Field-Marked Drawings and verify all information is accurate. The Contractor or Design-Builder shall verify that all changes to the Work have been documented. The Contractor or Design-Builder shall sign each sheet of the Record Drawings with the following certification(s):**

D. Submittals – Submit As-Built Drawings in accordance with paragraph SUBMITTALS. As-Built and Conforming to Construction Drawings must be approved by the City before the Contractor or Design-Builder submits the Application for Final Payment.

- 1. **Mark each document "AS-BUILT DRAWINGS" in neat, large print letters.**
- 2. **The cover sheet of the project shall be included. The cover sheet shall include all required As-Built certifications and shall clearly show that the drawings are AS-BUILT.**

3.05 RECORD MODEL

- A. BIM model of the structure constructed or modified during this project.
- B. Record Model should be per KC BIM standards with Record documents and drawings linked.
- C. All BIM files and associated files shall be tagged according to Record File Standard.

3.06 CONFORMING TO CONSTRUCTION DRAWINGS AND MODEL

- A. Conforming to Construction Drawings shall be submitted and accepted by the City before the Contractor or Design-Builder may submit the Application for Final Payment.
- B. The Contractor or Design-Builder shall edit the CAD drawings to reflect the changes shown on the As-Built Drawings. All line work and text shall be revised and edited to accurately reflect the information provided in the As-Built Drawings. Line work shall be drawn to scale in the coordinate system and datum specified herein.
- C. Version – CAD drawings shall be developed and submitted in the latest version of AutoCAD® .dwg format or AutoCAD® Civil 3D.

- D. CAD Standards – Comply with KC Water CAD Standards.
- E. GIS Standards – Comply with KC Water GIS Standards.
- F. The cover sheet of the project shall be included. The cover sheet shall include all required as-built certifications and shall clearly show that the drawings are as-built.
- G. Conforming to Construction Drawings shall have a “CONFORMED TO CONSTRUCTION” label clearly and prominently shown on each sheet, preferably in the lower right-hand corner of the drawing.
- H. Conforming to Construction Drawings shall be labeled with the following information:
 - 1. Project Name.
 - 2. WSD Project Number.
 - 3. WSD Work Order Number.
 - 4. WSD Drawing Number.
 - 5. CMMS Assets.
 - 6. Date of publication.

3.07 OTHER RECORD DOCUMENTS

- A. As defined by Section 00700 – General Conditions, Article 6 – Contractor or Design-Builder’s Responsibilities. Section 01021 – Operation and Maintenance Data, Section 01300 –Submittals, Section 01320 – Construction Progress Documentation, Section 01380 – Photographic Documentation, etc...
- B. GIS Data of Site Piping.
- C. Coordinates Table – Provide a Microsoft Excel spreadsheet that contains the coordinates of every asset installed or adjusted as part of the Work.
- D. Survey Cut Sheets.

END OF SECTION

SECTION 01021 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

A. SUMMARY

A. This Section includes administrative and procedural requirements for the preparation, submission, and City's Representative's review of Operation and Maintenance (O&M) Data.

1. The Contractor or Design-Builder shall furnish all labor, materials, equipment, and incidentals as necessary to comply with these requirements.

B. RELATED DOCUMENTS

B. Drawings and general provisions of the Contract; including General and Supplementary Conditions, all applicable Division 1 Sections, and all applicable Division Sections; apply to this Section.

C. Related Sections include the following:

1. Section 01019 – Closeout Procedures
2. Section 01020 – Record Documents
3. Section 01140 – Work Restrictions
4. Section 01140.01 - Process and System Shutdown Constraints Schedule
5. Section 01140.02 - Operation Change Control Plan Documents
6. Section 01020 – Record Documents
7. Section 01300 –Submittals
8. Section 01320 – Construction Progress Documentation
9. Section 01380 – Photographic Documentation
10. Section 01335 – Document Management

C. REQUIRMENTS

D. Contractor shall prepare and provide data and materials, and provide instruction and services, as specified in this Section.

E. Compile product data and related information appropriate for Owner's maintenance and operation of products and systems furnished under this Contract. Include Information on all motors supplied with equipment.

F. Prepare O&M Data as specified in this Section and as referenced in other pertinent sections of the Specifications.

G. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems, including electrical and instrumentation.

D. DEFINITIONS

H. O&M Data is including but not limited to:

1. Original Equipment Manufacturer Operation and Maintenance manuals.
2. Electronic O&M Manual for the entire project.

3. PLC, VFD, and SCADA Server Programs.

I. Preliminary Data: Initial and subsequent submissions for the City's Representative's review.

J. Final Data: City's Representative accepted data, submitted as specified herein.

K. Maintenance Operation: As used on Asset Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

E. SUBMITTALS

L. Informational:

1. Data Outline: Submit two copies of a detailed outline of proposed organization and contents of Final Data prior to the preparation of the Preliminary Data.

2. Preliminary Data:

a. Submit three copies for City's Representative's review including Relevant Standard Operation Procedures and Standard Instructions.

b. If Data meets the condition of the Contract:

1. One copy will be returned to Contractor or Design-Builder.

2. One copy will be forwarded to Resident Project Representative.

3. One copy will be retained in City's Representative's file.

c. If Data does not meet the condition of the Contract:

4. All copies will be returned to Contractor or Design-Builder with City's Representative's comments (on separate document) for revision.

5. City's Representatives comments will be retained in City's Representative's file.

6. Resubmit two copies revised in accordance with City's Representative's comments.

F. SEQUENCING AND SCHEDULING

M. Equipment and System Data:

1. Preliminary Data:

a. Do not submit until Shop Drawings for equipment or system has been reviewed and approved by City's Representative.

b. Submit prior to shipment.

2. Final Data: Submit instructional Manual Formatted data not less than 30 days prior to equipment or system field functional testing Submit Compilation Formatted and Electronic Media Formatted data prior to Substantial Completion of Project.

N. Materials and Finish Data:

1. Preliminary Data: Submit at least 15 days prior to request for final inspection.

2. Final Data: Submit within 10 calendar days after final inspection.

PART 2 - PRODUCTS

- A. DATA FORMAT (for Original Equipment Manufacture Operations and Maintenance Manuals OEM O&Ms)
 - O. Prepare preliminary and final data in the form of an instructional manual. Prepare final data on electronic media and printed.
 - P. Instructional Manual Format:
 - 1. Binder: Commercial quality, permanent, three ring or three post binder with durable plastic cover.
 - 2. Size: 8 ½ inches by 11 inches minimum.
 - 3. Cover: Identify manual with typed or printed title, “(relevant area) OPERATION AND MAINTENANCE MANUAL” and list.
 - a. Project title.
 - b. Designate applicable system, equipment, material, or finish.
 - c. Identify the assets covered in this O&M Manual.
 - d. Identify separate structure as applicable.
 - e. Identify volume number if more than one volume.
 - f. Identify of general subject matter covered in manual. Identity of equipment number and Specification section.
 - 4. Spine:
 - a. Project Title.
 - b. Volume number (if more than one volume).
 - 5. Title Page:
 - a. Contractor name, address, and telephone number.
 - b. Subcontractor, supplier, installer, or maintenance Contractor or Design-Builder’s name, address, and telephone number, as appropriate.
 - 1. Identify area of responsibility of each.
 - 2. Provide name and telephone number of local source of supply of parts and replacement.
 - 6. Table of Contents:
 - a. Neatly typewritten and arranged in systematic order with consecutive page numbers.
 - b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
 - 7. Paper: 20 pound minimum, white for typed pages.
 - 8. Text: Manufacturer’s printed data, or neatly typewritten.
 - 9. Three-hole punch data for binding and composition.
 - 10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.

Q. Data Compilation Format:

1. Compile all City's Representative's accepted preliminary O&M data into a hard copy, hard bound set.
2. Each set shall consist of the following:
 - a. Binder: Commercial quality, permanent, three ring or three post binders with durable plastic covers.
 - b. Cover: Identify each volume with typed and printed title "OPERATION AND MAINTENANCE DATA, VOLUME NO. _____ OF _____", and list:
 3. Project Title
 4. Contractor's name, address, and telephone number.
 5. If entire volume covers equipment or system provided by one supplier include the following:
 - a. Identity of general subject matter covered in manual.
 - b. Identity of equipment number and Specification section.
 - c. Provide each volume with title page and typed table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each binder.
 - d. Table of contents neatly typewritten, arranged in a systematic order:
 6. Include list of each product, indexed to content of each volume.
 7. Designate system or equipment for which it is intended.
 8. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
 - e. Section Dividers:
9. Heavy, 80 pound cover weight, tabbed with numbered plastic index tabs.
10. Fly leaf:
 - a. For each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment.
 - b. List with each product:
 - 1) Name, address, and telephone number of Sub-contractor, Supplier, Installer, and Maintenance Contractor or Design-Builder, as appropriate.
 - 2) Identify area of responsibility of each.
 - 3) Provide local source of supply for parts and replacement.
 - f. Assemble and bind material, as much as possible, in same order as specified in the Contract Documents.

R. Electronic Media Data:

1. Portable Document Format (PDF):
 - a. After all preliminary data has been found to be acceptable to City's Representative, submit Operation and Maintenance data in PDF format on CD.
 - b. Files to be exact duplicates of City's Representative's accepted preliminary data. Arrange by specification number, asset, and name.
 - c. Files to be fully functional and viewable in most recent version of Adobe Acrobat.
 - d. PDFs shall be bookmarked as appropriate with appropriate hyperlinks.
 - e. All files shall be tagged per the City's Record File tagging system.

S. DATA FOR EQUIPMENT SYSTEMS (Original Equipment Manufacturer Operations and Maintenance Manuals OEM O&Ms):

1. Content for each Unit (or Common Units) and System:
2. Product Data:
 - a. Include only those sheets that are pertinent to specific product.
 - b. Clearly annotate each sheet to:

11. Identify specific product or part installed.
12. Identify data applicable to installation.
13. Delete references to inapplicable information.
 - c. Function, normal operating characteristics, and limiting conditions.
 - d. Performance curves, engineering data, nameplate data, and tests.
 - e. Complete nomenclature and commercial number of replaceable parts.
 - f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
 - g. Spare parts ordering instructions.
 - h. Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).
3. As installed, color coded piping diagrams.
4. Charts of valve tag numbers, with the location and function of each valve.
5. Drawings: Supplement product data with drawings as necessary to clearly illustrate:
 - a. Format:
 14. Provide reinforced, punched, binder tab; bind in with text.
 15. Reduced to 8 ½ inches by 11 inches, or 11 inches by 17 inches folded to 8 ½ inches by 11 inches.
 16. Where reduction is impractical, fold and place in 8 ½ inch by 11 inch envelopes bound in text.
 17. Identify Specification section and product on drawings and envelopes.
 - b. Relations of component parts of equipment and systems.
 - c. Control and flow diagrams.
 - d. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
6. Instructions and procedures: Within text, as required to supplement product data.
 - a. Format:
 18. Organize in consistent format under separate heading for each different procedure.
19. Provide logical sequence of instructions for each procedure.
20. Provide information sheet for Owner's personnel, including:
 - a. Proper procedures in event of failure.
 - b. Instances that might affect validity of guarantee or Bond.
 - b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
 - c. Operating Procedures:
 21. Startup, break-in, routine, and normal operating instructions.
 22. Test procedures and results of factory tests where required.
 23. Regulation, control, stopping, and emergency instructions.
 24. Description of operation sequence by control manufacturer.
 25. Shutdown instructions for both short and extended duration.
 26. Summer and winter operating instructions, as applicable.
 27. Safety precautions.
 28. Special operating instructions.
 - d. Maintenance and Overhaul Procedure:
 29. Routine maintenance.
 30. Guide to troubleshooting.
 31. Disassembly, removal, repair, reinstallation, and re-assembly.
 32. Recommended work orders for preventative maintenance.

7. Guarantee, Bond, and Service Agreement: In accordance with section 01770, "Closeout Procedures".
 8. Standard Operating Procedures and Standard Instructions for each unit process in KCMO Water Services Format approved by the KCMO City's Representative and Utility and created by the engineer of record or an alternative acceptable to the KCMO City's Representative.
 9. Assets covered in this document.
- T. Content for each Electric or Electronic Item or System:
1. Description of Unit and Component Parts:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data, nameplate data, and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 - d. Interconnection wiring diagrams, including control and lighting systems.
 - e. Piping and Instrumentation Diagram of the unit.
 2. Circuit Directories of Panelboards.
 3. Electrical service.
 4. Control requirements and interface.
 5. Communication requirements and interfaces.
 6. List of electrical relay settings, and control and alarm contact settings.
 7. Electrical interconnection wiring diagram, including as applicable, single line, three line, schematic and internal wiring, tags per KCMO tagging standard and external interconnection wiring.
 8. As installed control diagrams by control manufacturer.
 9. Operating Procedures:
 - a. Routine and normal operating instructions.
 - b. Startup and shutdown sequences, normal, and emergency.
 - c. Safety precautions.
 - d. Special operating instructions.
 10. Maintenance Procedures:
 - a. Routine maintenance.
 - b. Guide to troubleshooting.
 - c. Adjustment and checking.
 - d. List of relay settings, control, and alarm contact settings.
 - e. Preventative Maintenance.
 11. Manufacturer's printed operating and maintenance instructions.
 12. List or original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
- U. Maintenance Summary:
1. Complete individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.
 2. The Maintenance Summary form shall be updated to incorporate the final recommendations established through the Maintenance Workshops described in Section 01320 Construction Progress Documentation.

3. Format:
 - a. Use Maintenance Summary Form bound with this section or electronic facsimile of such.
 - b. Each Maintenance Summary may take as many pages as required.
 - c. Use only 8 ½ inch by 11 inch size paper.
 - d. Complete using typewritten or electronic printing.
 4. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommended type, grade, and temperature range of lubricants and frequency of lubrication.
 5. Recommended Spare Parts:
 - a. Data to be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals.
 - b. "Unit" is the unit of measure for ordering the part.
 - c. "Quantity" is the number of units recommended.
 - d. "Unit Cost" is the current purchase price.
- V. The type and quantity of spare parts provided shall be consistent with Criticality Workshops and failure mode and effects analysis (FMEA) process FMEA process as described in Section 01320 Construction Progress Documentation.

B. DATA FOR MATERIALS AND FINISHES

- W. Content for Architectural Products, Applied Materials, and Finishes:
1. Manufacturer's data, giving full information on products:
 - a. Catalog number, size, and composition.
 - b. Color and texture designations.
 - c. Information required for reordering special manufactured products.
 2. Instructions for Care and Maintenance:
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods that are detrimental to product.
 - c. Recommended schedule for cleaning and maintenance.
- X. Content for Moisture and Weather Exposed Products:
1. Manufacturer's data, giving full information on products:
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Details of installation.
 2. Instructions for inspection, maintenance, and repair.

C. ELECTRONIC O&M MANUAL (E-O&M)

- Y. Contractor or Design-Builder shall provide a project specific Electronic O&M manual (e-O&M), which shall supplement the OEM O&M described. E-O&M shall contain the following information and functionalities:
1. Images (Photographic or digitally rendered) of the facility shall be provided in a "main screen" location, with specific facilities and systems labeled with all relevant names including but not limited to common names, CMMS tag and P&ID tags.
 2. Overall and Major system descriptions as provided in the O&M manual.
 3. Control Narratives for the overall project and individual systems/subsystems.

4. SOPs and SIs created by the Engineer of Record.
 5. Record Photographs providing a document of the construction progress, as well as buried/hidden piping, conduits, foundations, and other infrastructure not readily located after construction work at the facilities is complete.
 6. Manufacturer's shop drawings and O&M documents.
 7. BIM of the assets.
 8. Arc Flash Study.
 9. Load Study.
 10. Testing Results as identified in other Sections.
 11. GIS records for the project.
 12. As-Constructed/Record drawings and BIM of the completed facility.
 13. Final Submittals for all project components.
 14. Video recorded training organized by asset.
 15. All system-specific information shall be organized into accessible files tied to each system. Access shall be through a written and/or graphic interface at the main screen.
- Z. All files submitted as part of the E-O&M shall be tagged per the Record File Standard.
- AA. PDF shall be bookmarked and hyperlinked.
- BB. E-O&M will operate through adobe acrobat software unless Contractor or Design-Builder provides an alternative application that is accepted in writing by the City of Kansas City, MO.
- CC. A draft version of the e-O&M will be provided to the city for review and comment at approximately 70% completion of the facility.
- DD. E-O&M will be installed at/on the project facility server or workstation(s) as appropriate, and a copy will be provided to the CITY.
- EE. Contractor will provide training on the use and update of the e-O&M to CITY. One training session lasting no longer than two (2) hours will be provided at the project location, Water Services offices, or Contractor or Design-Builders officers, as agreed-upon by the CITY.
- FF. All source files to the electronic O&M manual will be linked to the as-built BIM model by relevant asset, Items relevant to multiple assets will have multiple links.
- GG. Complete a short-circuit device coordination and arc flash study computer model developed in SKM.
- HH. Update SKM load study provided by the Owner.

II. Complete Asset/CMMS data:

1. Owner will provide a template for machine reading assets and maintenance activities into the Owner's Computerized Maintenance Management System (CMMS).
2. Access database template will be blank with fields for assets information such as asset additions, asset updates, asset retirements including a rough estimated value, maintenance activities for the assets, PID tags within the asset, and asset categorization.
3. Contractor or Design-Builder shall fill out the template documenting changes in the CMMS; insert asset additions including value, updates and retired assets including estimated value when taken out of service; work order updates; new PMs; PMs to be retired; non-destructive testing updates; and other asset fields. Assets shall be coordinated and categorized with the applicable CMMS takes for entry into Owner's CMMS and Financial Software.

D. PROGRAMS

JJ. PLC, VFD, and SCADA Programs: Provide current native format copies of all software programs used to control assets.

1. Files should be named per asset equipment IDs, systems, or sub systems as appropriate.

E. SUPPLEMENTS

KK. The supplements listed below, following "End of Section", are part of this Specification.

1. Forms: Asset Maintenance Summary Form.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

ASSET MAINTENANCE SUMMARY FORM

PROJECT _____ CONTRACT NO _____

KCMO CMMS TAG _____

EQUIPMENT ITEM _____

MANUFACTURER _____

PID/TAG NUMBERS _____

WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) _____

NAMEPLATE DATA (hp, voltage, speed, etc.) _____

MANUFACTURER'S LOCAL REPRESENTATIVE _____

Name _____ Telephone Number _____

Address _____

MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	Frequency	Lubricant (if applicable)
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable)	List required frequency of each maintenance operation	Refer by symbol to lubricant required

LUBRICANTS

Reference Symbol	Shell	Exxon Mobil	Chevron Texaco	BP Amoco	or Equal

RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY

Part Number	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this contract with two asterisks				

Section 01070 - ABBREVIATIONS OF TERMS AND ORGANIZATIONS

1. LIST OF ABBREVIATIONS. Abbreviations for standards and organizations used in the Contract Documents are defined as follows:

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Antifriction Bearing Manufacturers Association now recognized as the ABMA
AFPA	American Forest & Paper Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AHRI	Air-Conditioning, Heating and Refrigeration Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association International
ANSI	American National Standards Institute
APA	Engineered Wood Association (formerly American Plywood Association)
API	American Petroleum Institute
AREMA	American Railway Engineers and Maintenance-of-Way Association
ASAHC	American Society of Architectural Hardware Consultants
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	ASTM International
AWG	American Wire Gauge
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America (formerly SCPI)

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CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard (U.S. Department of Commerce)
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
EI	Edison Electric Institute
EJCDC	Engineers' Joint Contract Documents Committee
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FCI	Fluid Controls Institute
Fed Spec	Federal Specification
FGMA	Flat Glass Marketing Association
FHWA	Federal Highway Administration
FIA	Factory Insurance Association
FM	Factory Mutual
FSA	Fluid Sealing Association
HEI	Heat Exchange Institute
HMI	Hoist Manufacturers Institute
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
I-B-R	Institute of Boiler and Radiator Manufacturers
IEEE	Institute of Electrical and Electronics Engineers
IBC	International Building Code
IES	Illuminating Engineering Society
IFI	Industrial Fasteners Institute
IPCEA	Insulated Power Cable Engineers Association
IRI	Industrial Risk Insurers
ISA	International Society of Automation
LEED	Leadership in Energy and Environmental Design
MHI	Materials Handling Institute
MIL	Military Specification
MMA	Monorail Manufacturers Association
MSS	Manufacturers Standardization Society of Valve and Fitting Industry
NAAMM	National Association of Architectural Metals Manufacturers

NACE	NACE International
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors
NBS	See NIST
NCSPA	National Corrugated Steel Pipe Association
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEII	National Elevator Industry, Inc.
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology (formerly NBS)
NLA	National Lime Association
NPC	National Plumbing Code
NPT	National Pipe Thread
NRMCA	National Ready Mixed Concrete Association
NSC	National Safety Council
NSF	NSF International (formerly National Sanitation Foundation)
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PS	Product Standard
RIS	Redwood Inspection Service
SAE	SAE International
SDI	Steel Door Institute
SFPA	Southern Forest Products Association
SI	Système International des Unités (International System of Units)
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPFA	Steel Plate Fabricators Association
SPI	Society of the Plastics Industry
SPTA	Southern Pressure Treaters Association
SSFI	Scaffolding, Shoring & Forming Institute, Inc
SSPC	SSPC: The Society for Protective Coatings
TABB	Testing, Adjusting, and Balancing Bureau
UL	Underwriters' Laboratories
USBR	U.S. Bureau of Reclamation
USGBC	U.S. Green Building Council

WEF

Water Environment Federation

End of Section

SECTION 01100 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification:
 - 1. Project Location: As listed in the work description below.
 - 2. Owner: City of Kansas City Missouri Water Service Department, 4800 East 63rd Street, Kansas City, Missouri 64130-4626.
- B. Engineer Identification: The Contract Documents were provided by Black & Veatch. Water Services Department has contracted with Black & Veatch to provide Design and Construction Phase Services.
- C. The work involves the installation of new equipment and software to establish a City-wide Wastewater SCADA System. A summary of the work at each location is described below. See Drawings and Specification Sections for additional details.

Facility Number/ Description	Scope Description
General	<p>1 - Reverse engineer existing logic on both replaced and reused programmable logic controllers (PLCs) and program PLCs to implement logic for integration into Rockwell PlantPax objects.</p> <p>2 - Reverse engineer existing logic and graphic screens for both replaced and reused human machine interface (HMI) software and operator interface terminals (OITs) for coordination with the new or revised PLC program.</p> <p>3 - Develop new PlantPax graphic screen and database for all facilities using standards developed as part of the Project.</p> <p>4 - Program all new and existing Ethernet switches to operate on virtual local area networks (VLANs) and to provide network communications required by the SCADA System.</p> <p>5 - Apply system-wide security for logging on to all new operator workstations and OITs. Workstations shall employ RFID scanners as a means of logging onto the workstation.</p> <p>6 - Provide permanent identification tags for all new and existing SCADA assets as identified on the Drawings.</p> <p>7 - Where PLCs are being replaced or added, provide necessary conduit, cabling, and miscellaneous hardware to terminate existing signals at new PLC.</p>
Fiber Optic Backbone	<p>1 - Install new single mode fiber optic cable spliced onto Owner's existing fiber optic network to create SCADA System fiber optic backbone as shown on the Drawings.</p> <p>2 - Provide fiber connections as indicated on the Drawings to create a city-wide fiber ring for communications redundancy.</p>
Task/Information Server	<p>1 - Update servers to share historical and real-time data for new SCADA sites on the Owner's enterprise network.</p>
Southwest Boulevard Sanitary & Flood Station (Facility 600)	<p>1 - Remove existing Microtel autodialer and ethernet switch from existing PLC panel.</p> <p>2 - Furnish and install new RFID scanner for existing PanelView Plus 1500 OIT. Program OIT for integration of the RFID scanner.</p> <p>3 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>4 - Furnish and install new UPS and provide communication to existing PLC and OIT. Program existing PLC and OIT to incorporate UPS alarms and statuses.</p> <p>5 - Wire existing HOA selector switches to existing PLC for monitoring. Program existing PLC and OIT to incorporate HOA statuses.</p>

Facility Number/ Description	Scope Description
25 th Street Flood Station (Facility 601)	<p>1 - Remove existing Microtel autodialer and ethernet switch from existing PLC panel.</p> <p>2 - Furnish and install new RFID scanner for existing PanelView Plus 1500 OIT. Program OIT for integration of the RFID scanner.</p> <p>3 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>4 - Provide communication connection between existing UPS and existing PLC and OIT. Program existing PLC and OIT to incorporate UPS alarms and statuses.</p> <p>5 - Wire existing HOA selector switches to existing PLC for monitoring. Program existing PLC and OIT to incorporate HOA statuses.</p>
Broadway Flood Station (Facility 603)	<p>1 - Remove existing storage cabinets as shown on the Drawings.</p> <p>2 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Program new PLC with PlantPax objects.</p> <p>3 - Provide network communications cabling between new PLC and existing Evoqua pump controller. Program new PLC to incorporate alarms and statuses from the pump controller.</p> <p>4 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, pole, and mounting system.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
North Airport Flood Station (Facility 604)	<p>1 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system.</p> <p>2 - Remove existing ethernet switch and UPS from existing PLC panel.</p> <p>3 - Reprogram existing CompactLogix PLC for PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel outside existing PLC panel and Layer 3 ethernet switch within existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to existing PLC. Program existing PLC to incorporate UPS alarms and statuses.</p>

Facility Number/ Description	Scope Description
Gillis Flood Station (Facility 606)	<p>1 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Program new PLC with PlantPax objects.</p> <p>2 - Provide network communications cabling between new PLC and existing Evoqua pump controller. Program new PLC to incorporate alarms and statuses from the pump controller.</p> <p>3 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new PLC panel. Terminate fibers at new fiber patch panel.</p> <p>4 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>5 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
Lydia Flood Station (Facility 607)	<p>1 - Remove existing Microtel autodialer.</p> <p>2 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Program new PLC with PlantPax objects.</p> <p>3 - Provide network communications cabling between new PLC and existing Evoqua pump controller. Program new PLC to incorporate alarms and statuses from the pump controller.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
Prospect Flood Station (Facility 608)	<p>1 - Remove existing Microtel autodialer.</p> <p>2 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Program new PLC with PlantPax objects.</p> <p>3 - Provide network communications cabling between new PLC and existing Evoqua pump controller. Program new PLC to incorporate alarms and statuses from the pump controller.</p> <p>4 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>

Facility Number/ Description	Scope Description
Milwaukee Flood Station (Facility 609)	<p>1 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system.</p> <p>2 - Remove existing ethernet switch from existing PLC panel.</p> <p>3 - Reprogram existing CompactLogix PLC for PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel outside existing PLC panel and Layer 3 ethernet switch within existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Provide communication connection between existing UPS and existing PLC. Program existing PLC to incorporate UPS alarms and statuses.</p>
Truman Flood Station (Facility 610)	<p>1 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing mast in place.</p> <p>2 - Remove existing Microtel autodialer, ethernet switch, and UPS from existing PLC panel.</p> <p>3 - Reprogram existing CompactLogix PLC for PlantPax objects.</p> <p>4 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing mast.</p> <p>5 - Furnish and install a new Layer 2 ethernet switch in the existing PLC panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p>
Hawthorn Flood Station (Facility 611)	<p>1 - Remove existing Microtel autodialer.</p> <p>2 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Program new PLC with PlantPax objects.</p> <p>3 - Provide network communications cabling between new PLC and existing Evoqua pump controller. Program new PLC to incorporate alarms and statuses from the pump controller.</p> <p>4 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, pole, and mounting system.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>

Facility Number/ Description	Scope Description
Blue Bank Flood Station (Facility 612)	<p>1 - Remove existing MicroLogix PLC from existing PLC panel and existing autodialer.</p> <p>2 - Identify and label existing field terminations in existing PLC panel. Reuse existing PLC panel as a junction box to provide signal connections to new PLC panel.</p> <p>3 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel outside existing PLC panel and Layer 3 ethernet switch within new PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
South Airport Flood Station (Facility 614)	<p>1 - Remove existing SLC 5/05 PLC, Microtel autodialer, and UPS from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system.</p> <p>3 - Replace existing SLC 5/05 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. (Some conduit furnished and installed by others, see Drawings for additional detail.) Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>

Facility Number/ Description	Scope Description
North Church Estates Sanitary Station (Facility 619)	<p>1 - Remove existing SLC 5/03 PLC and backup power batteries from existing PLC panel and Microtel autodialer from separate panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Furnish and install new communication panel as shown on the Drawings.</p> <p>5 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing pole.</p> <p>6 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>7 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
Pied Creek Sanitary Station (Facility 623)	<p>1 - Remove existing UPS from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Furnish and install new RFID scanner for existing PanelView Plus OIT. Program OIT for integration of the RFID scanner.</p> <p>4 - Furnish and install new communication panel as shown on the Drawings.</p> <p>5 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing pole.</p> <p>6 - Furnish and install new UPS and provide communication to existing PLC and OIT. Program existing PLC and OIT to incorporate UPS alarms and statuses.</p> <p>7 - Wire existing HOA selector switches to existing PLC and OIT for monitoring. Program existing PLC and OIT to incorporate HOA statuses.</p> <p>8 - Provide network communications cabling between existing engine generator and existing PLC. Program existing PLC and OIT to incorporate generator alarms and statuses.</p>

Facility Number/ Description	Scope Description
First Creek Sanitary Station (Facility 631)	<p>1 - Remove existing UPS from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing tower in place.</p> <p>3 - Furnish and install new RFID scanner for existing PanelView Plus 1500 OIT. Program OIT for integration of the RFID scanner.</p> <p>4 - Reprogram existing ControlLogix and PanelView Plus 1500 for PlantPAX objects.</p> <p>5 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing tower.</p> <p>6 - Furnish and install new UPS and provide communication to existing PLC and OIT. Program existing PLC and OIT to incorporate UPS alarms and statuses.</p> <p>7 - Provide network communications cabling between existing engine generator and existing PLC. Program existing PLC and OIT to incorporate generator alarms and statuses.</p>
Second Creek Sanitary Station (Facility 632)	<p>1 - Remove existing UPS from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing tower in place.</p> <p>3 - Furnish and install new RFID scanner for existing PanelView Plus 1500 OIT. Program OIT for integration of the RFID scanner.</p> <p>4 - Reprogram existing ControlLogix and PanelView Plus 1500 for PlantPAX objects.</p> <p>5 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing tower.</p> <p>6 - Furnish and install new UPS and provide communication to existing PLC and OIT. Program existing PLC and OIT to incorporate UPS alarms and statuses.</p>

Facility Number/ Description	Scope Description
South Airport Relief Flood Station (Facility 637)	<p>1 - Remove existing Digital Control Corporation pump controller from existing motor starter panel.</p> <p>2 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Program new PLC for pump monitoring and control to replace removed pump controller. Program new PLC with PlantPAX objects.</p> <p>3 - Install new single mode fiber optic cable from Owner's existing fiber backbone network. (Conduit to be furnished and installed by others, see Drawings for additional detail.) Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new PLC panel. Terminate fibers at new fiber patch panel.</p> <p>4 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>5 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
Wildwood West Sani- tary Station (Facility 642)	<p>1 - Remove existing SLC 5/03 PLC from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPAX objects.</p> <p>4 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing pole.</p> <p>5 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
KCI Industrial Sanitary Station (Facility 643)	<p>1 - Remove existing SLC 5/03 PLC and UPS from existing PLC panel and Microtel autodialer from separate panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPAX objects.</p> <p>4 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing pole.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p>

Facility Number/ Description	Scope Description
Briarcliff West Sanitary Station (Facility 646)	<p>1 – Remove existing SLC 5/03 PLC and backup power batteries from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Furnish and install new communication panel as shown on the Drawings.</p> <p>5 - Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new communication panel. Terminate fibers at new fiber patch panel.</p> <p>6 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>7 - Provide network communications cabling between existing engine generator and new PLC. Program existing PLC to incorporate generator alarms and statuses.</p>
Northland Mobile Sanitary Station (Facility 657)	<p>1 – Remove existing SLC 5/05 PLC, PanelView 600 OIT, and backup power batteries from existing PLC panel and Microtel autodialer from existing radio panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/05 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Replace existing PanelView 600 OIT with new PanelView Plus 7.</p> <p>7. Reverse engineer existing OIT for new OIT. Program new OIT with PlantPax objects.</p> <p>5 - Furnish and install new RFID scanner for new PanelView Plus 7 OIT. Program OIT for integration of the RFID scanner.</p> <p>6 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing pole.</p> <p>7 - Furnish and install new UPS and provide communication to new PLC and OIT. Program new PLC and OIT to incorporate UPS alarms and statuses.</p> <p>8 - Provide hardwired connections between existing engine generator and new PLC. Program new PLC and OIT to incorporate generator alarms and statuses.</p>

Facility Number/ Description	Scope Description
Chouteau Sanitary Station (Facility 659)	<p>1 - Remove existing ethernet switch from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing ControlLogix processor to accommodate incorporation of PlantPax objects. Reprogram existing ControlLogix for PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel outside existing PLC panel and Layer 3 ethernet switch within existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Provide communication connection between existing UPS and existing PLC. Program existing PLC to incorporate UPS alarms and statuses.</p> <p>6 - Provide network communications cabling between existing engine generator and existing PLC. Program existing PLC to incorporate generator alarms and statuses.</p>
Riverside Horizons Sanitary Station (Facility 662)	<p>1 - Remove existing SLC 5/05 PLC, MicroLogix PLC, PanelView 300 OIT, and backup power batteries from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/05 PLC rack with new ControlLogix hardware. Reverse engineer existing SLC 5/05 and MicroLogix PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Reverse engineer existing PanelView 300 OIT to incorporate into existing PanelView Plus 1250 OIT. Program existing PanelView Plus 1250 with PlantPax objects.</p> <p>5 - Furnish and install new RFID scanner for existing PanelView Plus 1250 OIT. Program OIT for integration of the RFID scanner.</p> <p>6 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing pole.</p> <p>7 - Furnish and install new UPS and provide communication to new PLC and existing OIT. Program new PLC and existing OIT to incorporate UPS alarms and statuses.</p> <p>8 - Provide hardwired connections between existing engine generator and new PLC. Program new PLC and existing OIT to incorporate generator alarms and statuses.</p> <p>9 - Provide hardwired connections between existing vendor panel and new PLC. Program new PLC and existing OIT to incorporate vendor system alarms and statuses.</p>

Facility Number/ Description	Scope Description
Birchwood Sanitary Station (Facility 663)	<p>1 – Remove existing SLC 5/03 PLC and backup power batteries from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Furnish and install new communication panel as shown on the Drawings.</p> <p>5 - Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new communication panel. Terminate fibers at new fiber patch panel.</p> <p>6 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p>
Gregory Ridge Sanitary Station (Facility 664)	<p>1 - Remove existing ethernet switch and UPS from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Reprogram existing ControlLogix for PlantPax objects.</p> <p>4 - Reprogram existing PanelView Plus 7 OIT for PlantPax objects.</p> <p>5 - Furnish and install new RFID scanner for existing PanelView Plus 7 OIT. Program OIT for integration of the RFID scanner.</p> <p>6 - Furnish and install new communication panel as shown on the Drawings.</p> <p>7 - Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. (Some conduit furnished and installed by others, see Drawings for additional detail.) Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new communication panel. Terminate fibers at new fiber patch panel.</p> <p>8 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p>

Facility Number/ Description	Scope Description
12th Street Sanitary Station (Facility 667)	<p>1 – Remove existing SLC 5/03 PLC and backup power batteries from existing PLC panel.</p> <p>2 - Remove existing radio panel and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Identify and label existing field terminations in existing PLC enclosure (MCC section). Reuse existing MCC section as a junction box to provide signal connections to new PLC panel.</p> <p>4 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>5 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Reuse existing pole.</p> <p>6 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>7 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
South Air Pumping Sanitary Station (Facility 676)	<p>1 – Remove existing SLC 5/03 PLC from existing PLC panel.</p> <p>2 - Remove existing radio panel and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Furnish and install new communication panel as shown on the Drawings.</p> <p>5 - Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. (Some conduit to be furnished and installed by others, see Drawings for additional detail.) Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new communication panel. Terminate fibers at new fiber patch panel.</p> <p>6 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>7 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>

Facility Number/ Description	Scope Description
118th and Lawndale Sanitary Station (Facility 677)	<p>1 – Remove existing SLC 5/03 PLC from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. Furnish and install new fiber optic patch panel in existing communication panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
Lake Waukomis Sanitary Station (Facility 682)	<p>1 - Remove existing Microtel autodialer and backup power batteries from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Reprogram existing ControlLogix for PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to existing PLC. Program existing PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to existing PLC for monitoring. Program existing PLC to incorporate HOA statuses.</p>

Facility Number/ Description	Scope Description
White Aloe Sanitary Station (Facility 684)	<p>1 - Remove existing SLC 5/03 PLC and backup power batteries from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to existing PLC. Program existing PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to existing PLC for monitoring. Program existing PLC to incorporate HOA statuses.</p>
Brush Creek Sanitary Station (Facility 686)	<p>1 - Remove existing SLC 5/03 PLC and backup power batteries from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Furnish and install new communication panel as shown on the Drawings.</p> <p>5 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new communication panel. Terminate fibers at new fiber patch panel.</p> <p>6 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>7 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
Upper Rush Sanitary Station (Facility 687)	<p>1 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Terminate fibers at existing fiber patch panel.</p>

Facility Number/ Description	Scope Description
Harlem Sanitary Station (Facility 688)	<p>1 - Remove existing SLC 5/03 PLC and UPS from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
83rd Street Sanitary Station (Facility 692)	<p>1 - Remove existing SLC 5/03 PLC and backup power batteries from existing PLC panel and Microtel autodialer from separate panel.</p> <p>2 - Remove existing radio and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>

Facility Number/ Description	Scope Description
Birmingham Sanitary Station (Facility 693)	<p>1 - Remove existing UPS from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system.</p> <p>3 - Furnish and install new RFID scanner for existing PanelView Plus 1500 OIT. Program OIT for integration of the RFID scanner.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel in empty dry well upper level room. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install fiber optic cable and conduit from fiber optic patch panel in empty dry well upper level room to existing PLC panel. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>6 - Furnish and install new UPS and provide communication to existing PLC and OIT. Program existing PLC and OIT to incorporate UPS alarms and statuses.</p>
Mace Road Sanitary Station (Facility 694)	<p>1 - Remove existing SLC 5/03 PLC, Microtel autodialer, and backup power batteries from existing PLC panel.</p> <p>2 - Remove existing radio and associated items, including radio, surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPax objects.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in existing PLC panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>6 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
Weatherby Lake Sanitary Station (Facility 696)	<p>1 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Terminate fibers at existing fiber patch panel.</p>

Facility Number/ Description	Scope Description
Platte Woods Sanitary Station (Facility 697)	<p>1 - Remove existing SLC 5/03 PLC and backup power batteries from existing PLC panel and Microtel autodialer from separate panel.</p> <p>2 - Remove existing radio and associated items, including surge protector, coaxial cable, antenna, and mounting system. Leave existing pole in place.</p> <p>3 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPAX objects.</p> <p>4 - Furnish and install new communication panel as shown on the Drawings.</p> <p>5 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new communication panel. Terminate fibers at new fiber patch panel.</p> <p>6 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p> <p>7 - Wire existing HOA selector switches to new PLC for monitoring. Program new PLC to incorporate HOA statuses.</p>
Kemper Flood Station (Facility 699)	<p>1 - Remove existing SLC 5/04 PLC and backup power batteries from existing PLC panel and Microtel autodialer from separate panel.</p> <p>2 - Replace existing SLC 5/03 PLC rack with new ControlLogix hardware. Reverse engineer existing PLC logic for new ControlLogix. Program new PLC with PlantPAX objects.</p> <p>3 - Furnish and install new communication panel as shown on the Drawings.</p> <p>4 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new communication panel. Terminate fibers at new fiber patch panel.</p> <p>5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.</p>
Birmingham WWTP (Facility 711)	<p>1 - Remove two existing radios and associated items, including surge protectors, coaxial cables, antennas, and mounting systems.</p> <p>2 - Furnish and install new RFID scanner for existing PanelView Plus 1500 OIT. Program OIT for integration of the RFID scanner.</p> <p>3 - Install new single mode fiber optic cable and conduit from Owner's existing fiber backbone network. Furnish and install new fiber optic patch panel in switchgear building. Terminate fibers at new fiber patch panel.</p> <p>4 - Furnish and install Layer 3 ethernet switch in existing PLC panel.</p> <p>5 - Provide communication connection between existing UPS and existing PLC and OIT. Program existing PLC and OIT to incorporate UPS alarms and statuses.</p>

Facility Number/ Description	Scope Description
Birmingham WWTP Control Room (Facility 711)	<p>1 – Furnish and install resinous flooring on top of the existing concrete floor.</p> <p>2 – Furnish and install new conduit to the operator stations.</p> <p>3 – Demo existing control room door and furnish and install a new hollow metal door and door frame.</p> <p>4 – Demo existing mop sink and patch floor in its place. Install new mop sink in southwest corner of control room.</p> <p>5 – Furnish and install new door hardware for exterior double door.</p> <p>6 – Demo existing window-style air conditioning unit and associated electrical circuit and accessories. Repair opening to match existing wall.</p> <p>7 – Relocate existing equipment as shown on the Drawings.</p> <p>8 – Demo existing operator station items as shown on the Drawings.</p> <p>9 – Install operator station furniture as shown on the Drawings.</p> <p>10 – Modify existing ice maker drain piping to drain indirectly above the existing waste receptacle.</p> <p>11 – Furnish and install acoustic wall panels as shown on the Drawings and related sections.</p> <p>12 – Furnish and install a network rack and server as shown on the Drawings. Provide connection between server and existing PLC in electrical room.</p> <p>13 – Relocate existing HVAC control panel as shown on the Drawings.</p> <p>14 – Demo existing discontinued ductwork as shown on the Drawings.</p> <p>15 – Demo existing light fixtures. Furnish and install light fixtures as shown on the Drawings.</p>
Westside WWTP Control Room (Facility 712)	<p>1 – Wax and buff existing vinyl composite tile (VCT) flooring.</p> <p>2 – Repair and repaint existing concrete masonry unit (CMU) walls.</p> <p>3 – Paint existing cabinets as shown on the Drawings.</p> <p>4 – Demo existing window-style air conditioning unit and associated electrical circuit and accessories. Repair opening to match existing wall.</p> <p>5 – Demo existing plaster ceiling system. Furnish and install suspended system with aluminum grid and acoustic ceiling panels as shown on the Drawings and related sections.</p> <p>6 – Relocate existing equipment as shown on the Drawings.</p> <p>7 – Demo existing operator station items as shown on the Drawings.</p> <p>8 – Install operator station furniture as shown on the Drawings.</p> <p>9 – Demo existing light fixtures. Furnish and install light fixtures as shown on the Drawings.</p> <p>10 – Demo existing HVAC items as shown on the Drawings. Furnish and install HVAC items as shown on the Drawings.</p>
Todd Creek WWTP (Facility 715)	<p>1 – Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. Terminate fibers at existing fiber patch panel.</p>

Facility Number/ Description	Scope Description
Rocky Branch WWTP Control Room (Facility 718)	1 – Wax and buff existing vinyl composite tile (VCT) flooring. 2 – Repair and repaint existing gypsum board walls. 3 – Demo existing ceiling tiles. Repair ceiling grid as necessary. Furnish and install suspended ceiling tiles. Clean all diffusers. 4 – Relocate existing equipment as shown on the Drawings. 5 – Demo existing operator station items as shown on the Drawings. 6 – Install operator station furniture as shown on the Drawings. 7 – Demo existing light fixtures. Furnish and install light fixtures as shown on the Drawings.
Fishing River WWTP Control Room (Facility 720)	1 – Repair and repaint existing gypsum board walls. 2 – Relocate existing equipment as shown on the Drawings. 3 – Demo existing operator station items as shown on the Drawings. 4 – Install operator station furniture as shown on the Drawings. 5 – Demo existing light fixtures. Furnish and install light fixtures as shown on the Drawings.
KCI De-Icing Flood Station (Facility 745)	1 - Furnish and install new PLC panel with ControlLogix hardware and associated components as shown on the Drawings. Program new PLC with PlantPax objects. 2 - Furnish and install new Layer 3 ethernet switch in existing PLC panel. 3 - Provide network communications cabling between new Layer 3 ethernet switch in existing PLC panel and new Layer 3 ethernet switch in new PLC panel. Program new PLC to incorporate statuses and alarms from the four existing SLC 5/05 PLCs on the aviation department network. 4 - Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch in new PLC panel. Terminate fibers at new fiber patch panel. 5 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.
East Tank Tower (Facility 848)	1 - Furnish and install new PLC backpanel with ControlLogix hardware and associated components in existing network rack as shown on the Drawings. Program new PLC as data concentrator for remote radio sites. Program new PLC with PlantPAX objects. 2 - Furnish and install a new 220 MHz radio and associated items, including DNP3 over Ethernet gateway, security appliance, surge protector, coaxial cable, antenna, and mounting system. Use existing radio tower. 3 - Install new single mode fiber optic cable and conduit from Owner’s existing fiber backbone network. Furnish and install new fiber optic patch panel and Layer 3 ethernet switch on new PLC backpanel. Terminate fibers at new fiber patch panel. 4 - Furnish and install new UPS and provide communication to new PLC. Program new PLC to incorporate UPS alarms and statuses.

- D. In addition to other requirements in the specifications, specific project sequencing and time restrictions required for this project are included in the Supplementary Conditions (SC-12.01), and Project Requirements Section.

1.03 CONTRACT

- A. Project will be constructed under a general construction contract.
 - 1. Project Title: Wastewater SCADA System Improvements Phase 2.
 - 2. Project Number: 81000819
 - 3. Contract Number: 1712
- B. Proper bid and contract forms including but not limited to Bid Bond, Performance and maintenance Bonds, Payment
- C. Bonds, and Insurance Certificate must be used. AIA forms are NOT acceptable. Failure to use proper forms may invalidate your bid.
- D. Work may be necessary during cold, hot, or inclement weather. Refer to the Construction Progress Documentation specification section (01320) for additional requirements.

1.04 SPECIAL REQUIREMENTS

- A. See the Construction and Schedule Requirements paragraph of the Project Requirements Section for special requirements regarding shutdowns.

1.05 USE OF PREMISES

- A. Limit the use of the premises for his/her Work and for storage to allow for:
 - 1. Owner occupancy.
 - 2. Continued operation of the plant.
- B. Coordinate use of premises with Owner and Engineer. Perform Work to accommodate Owner's occupancy. Owner will occupy premises during performance of the work to conduct his/her normal operations and will continue to operate adjacent equipment.
- C. Contractor shall limit site disturbance on the entire site, including earthwork and clearing of vegetation, to 40 feet beyond building or other major structure perimeters; 10 feet beyond surface walkways, patios, surface parking, and trenches for utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs, main utility trenches, outdoor equipment pads, and electrical equipment yards; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities) that require additional staging areas in order to limit compaction in the constructed area.

- D. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors' materials and equipment stored on the site.
- E. If directed by the Owner or Engineer, move any stored items, which interfere with operations of Owner or other contractors.
- F. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.06 PARTIAL USE OR OCUPANCY

- A. As work at each facility is completed, the Owner will need to continue operation. Substantial Completion of Work for Owner's Occupancy or use include specified training of Owner's personnel and completion of specified testing. Overall project Substantial Completion will require all work to be complete.

1.07 REFERENCE STANDARDS

- A. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or laws or regulations in effect at the time of opening of the Bids (or on the Effective Date of the Agreement if there are no Bids), except as may be otherwise specifically stated. However, no provision of any referenced standard, specification, manual, or code (whether or not specifically incorporated by reference in the Contact Documents) shall be effective to change the duties and responsibilities of Owner, Contractor, or Engineer, or any of their Consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to Engineer, or any of the Engineer's Consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the work.

1.08 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
3. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

Section 01140 - WORK RESTRICTIONS

1. GENERAL. This section includes requirements for sequencing and scheduling the Work affected by existing sites and facilities; work restrictions; and coordination between construction operations and plant operations.

2. SUBMITTALS.

- A. Baseline Schedule with OCCP tasks.
- B. Operational Change Control Plan (OCCP) Form.
- C. Progress Schedule with OCCP tasks.

3. GENERAL CONSTRAINTS ON SEQUENCE AND SCHEDULING OF WORK

- A. The sites shall always be monitored either via SCADA or manned. The Contractor shall not operate the existing plant and shall notify the City using the OCCP form included in Section 01800.
- B. A pre-work meeting shall be held at each site prior to commencement of any work on the site. For critical work, Monday morning meetings shall be held and followed by a Friday follow-up meeting.
- C. Maintenance of Operations:
 - a. The facilities are the City's means of conveying and treating combined sewage for the designated service areas prior to discharging to the Missouri River. Impairing the operational capabilities of the treatment plant will result in serious environmental damage and monetary fines.
 - b. Conduct Work in a manner that will not impair the operational capabilities of essential elements of the treatment process or reduce the capacity of the entire treatment plant below levels sufficient to treat the quality of raw wastewater to the water quality limitations specified in the discharge permit.
 - c. The status of the treatment plant shall be defined as "operational" when it is capable of treating the entire quantity of wastewater received to the water quality limits specified in the discharge permit.

4. SHUTDOWN AND CONSTRUCTION CONSTRAINTS

- A. See the Project Requirements Section. General shutdown constraints include:
 - 1. Execute the Work while the existing facility is in operation.
 - 2. Some activities may be accomplished without a shutdown.
 - 3. Apply to activities of construction regardless of process or work area.
 - 4. Activities that disrupt plant or utilities operations must comply with these shutdown constraints.
 - 5. Organize work to be completed in a minimum number of shutdowns.
 - 6. Provide thorough advanced planning, including having required equipment, materials, and labor on hand at time of shutdown.
 - 7. Final determination of the permitting of shutdowns will be the sole judgment of the Owner.
 - 8. Owner maintains the ability to abort on the day of the scheduled shutdown.

5. OPERATIONAL CHANGE CONTROL PLAN (OCCP)

- A. Refer to the Operational Change Control Plan Section.
- B. Submit Baseline Schedule with proposed OCCPs.
- C. No consideration will be given to claims of additional time and cost associated to preparing OCCPs required by the Owner and Engineer to complete this work in a manner that facilitates proper operation of the facilities and compliance with effluent discharge criteria.

6. WORK SEQUENCE AND CONSTRAINTS

A. General:

- 1. Utilize description of critical events in work sequence in this Section as a guideline for scheduling and undertaking the Work.
- 2. Work sequence and constraints presented do not include all items affecting completion of the Work, but are intended to describe critical events necessary to minimize disruption of the existing facilities and to ensure compliance with NPDES permit requirements.

B. Working Hours:

- 1. The CONTRACTOR shall limit normal construction activities to the time period from 7:00 a.m. to 6:00 p.m., Monday through Friday. All requests for work hours outside these times or on Saturday, Sunday, or any OWNER observed holiday, shall be approved in writing by the OWNER.
- 2. Emergency work may be performed without prior permission, but the OWNER must be immediately notified.
- 3. Round-the-clock work may be required for making modifications to existing structures to minimize interruption of facilities operation with prior written approval of the OWNER.

END OF SECTION

01140.01 - PROCESS AND SYSTEM SHUTDOWN CONSTRAINTS SCHEDULE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Information on the shutdown constraints for each of the major processes.

1.02 DEFINITIONS

- A. Maximum Shutdown Duration: The maximum allowable time in calendar days (unless otherwise noted) that a process and its associated piping, valves, channels, gates, etc. may be removed from service to perform the required work on that process.
- B. Minimum Time Between Shutdowns: The minimum amount of time in calendar days (unless otherwise noted) between consecutive shutdowns of a process and its associated piping, valves, channels, gates, etc. 3.
- C. Maximum Number of Shutdowns: The maximum number of times that a process and its associated piping, valves, channels, gates, etc. may be removed from service to perform the required work on that process. In cases where only one (1) shutdown is allowed, a value has been listed in the "Minimum Time Between Shutdowns" column to provide guidance if additional shutdowns are determined to be required.
- D. Seasonal Shutdown Constraint: The approximate time period during which a process shall remain in service and no work shall be performed on that process.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PROCESS AND SYSTEM SHUTDOWN CONSTRAINTS SCHEDULE

- A. The Process and System Shutdown Constraints Schedule is as follows:
 - 1. Facility is currently operating. Ensure construction activities do not interfere with Owner's operation of facility, except as allowed below.
 - 2. Wet well is constructed of two sections that can be isolated. One section should always be available for use. Coordinate with Owner prior to isolating and removing a wet well section from use.
 - 3. Planned shutdown will be allowed. The following constrains shall relate to the shutdown periods.
 - a) The Contractor may assume that under normal dry weather flow conditions, that the City can block flow into the pump station for a period not to exceed 6 hours.
 - b) No more than one 6 hour shutdown period will be allowed in any 24 hour consecutive time period.

- B. Requests for variance from any part of this schedule must be approved in writing by the OWNER.
- C. The planned date of shutdown as listed on the Operational Change Control Plan (OCCP) form shall be considered the start date for the shutdown and used for calculating the actual shutdown duration, unless approved in writing by the OWNER. In the event that the OWNER can shut down a system or process prior to the planned date of shutdown and the CONTRACTOR agrees to commence work at that earlier date, the date that the CONTRACTOR commences work on the associated process or system shall be considered the start date for the shutdown and for calculating the actual shutdown duration.
- D. These constraints are intended to supplement the demolition, modification, tie-in, and construction activities and constraints described in Section 01140 - Work Restrictions.

END OF SECTION



KC WATER

WASTEWATER TREATMENT DIVISION

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Operational Change Control Plan (OCCP) Version 8

OCCP Number & Title (The OCCP number will be provided by the Division OCCP Coordinator)

OCCPs ARE REQUIRED TWO WEEKS IN ADVANCE OF THE ANTICIPATED WORK

This version is being provided as a Word document to enable editing within the document.

Do not delete any sections. Note if a section is not applicable to the proposed work.

Instructions are provided at the beginning of each section. **READ THESE CAREFULLY.** Provide the information requested. The submitted document is to include this title page.

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1. Date	
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2. Version (use modifier starting with A at end of OCCP number when document changes substantially)	
3. OCCP Number	
4. Facility Name/ Facility ID	
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6. Description of Works (provide a brief summary of the work to be performed)

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7. Key Plan information (hold points are those points at which work will be halted and operations returned to usual and customary conditions and is not a description of the work to be performed)

Description of Hold Point 1	
Description of Hold Point 2	
Description of Hold Point 3	
Description of Hold Point 4	
Description of Hold Point 5	
Description of Hold Point 6	
Description of Hold Point 7	
Description of Hold Point 8	

8. Significant Dates (this section keys around the OCCP development to include a meeting with WTD staff to define operational collaboration)

Project is scheduled to start no earlier than (insert date here)	
Action	Date
OCCP Initial Development no later than:	
OCCP Final no later than:	
OCCP Coordination Meeting no later than:	
Other as needed:	
Other as needed:	

9. Project Milestones/Execution Steps (define the major work steps and attach a schedule for the work if so developed specifically for this OCCP project)

Step	Action and Date (may include start date + X if start is unknown at the time of OCCP development)

Step	Action and Date (may include start date + X if start is unknown at the time of OCCP development)

10. Works to be completed prior start of OCCP (this will result from the initial OCCP meeting)

Operational Condition	Contingency Action

11. Contingency Actions (these actions result from plans in the event of adverse project impacts)

Mode of Failure/Incident	Contingency Action

12. Job Hazard Analysis (define any hazards to be encountered that are not usual and customary)

Hazard	Mitigation

13. Affected monitoring points and impact

- a. Usual sample locations affected by this operation (this will result from the initial OCCP meeting)

Description of Element	How is it Affected

- b. Special location(s) established for this operation (this will result from the initial OCCP meeting)

Description of Location	Describe Revised Procedure

- c. **Treatment Process Affected** (define which process will be impacted and how any alternate or interim operation will be implemented)

Process Description	Describe Alternate or Interim Operation
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d. Alarm Modifications

Alarm name	Alarm Value	Replacement	How Does it Operate?

e. Environmental Spill Risks

Description of Spill Risks	Mitigating Controls

14. Wastewater Quality Impacts

Description of Impact	How It Will Be Managed

15. External Stakeholders To Be Notified (these include neighboring residential and businesses)

Individual or Entity	Name and Phone Number

16. Contractor OCCP Development and Sign Off (these include the prime and any subs performing the work and to ensure all contractor teams are aware of the work plan)

Name and Title	Signature

17. WWTD OCCP Final Authorization and Approval (to include the WTD chain of command from the CPO to the Division Manager and a senior representative from each contractor team)

Name	Title	Signature	Date

Section 01210 - ALLOWANCES

1. GENERAL. This section includes a description of the allowances and related responsibilities.
2. ALLOWANCE AMOUNTS
 1. Unforeseen site conditions, hardware and programming additions, licensing additions, and unknown conditions: \$100,000.
 2. Pre-negotiated Rockwell Automation software purchase: \$64,581.72.
3. DUTIES OF CONTRACTOR IN PROVIDING PRODUCTS BY ALLOWANCE
 - A. Advise Engineer at least 60 days in advance of purchase date necessary to avoid impacts to Progress Schedule.
 - B. Obtain proposals from suppliers, including:
 - Quantity.
 - Complete description of product and services provided under allowance.
 - Unit cost.
 - Total amount of purchase.
4. ADJUSTMENT OF COSTS
 - A. When actual cost is more or less than amount of allowance, Contract Price will be adjusted by Change Order.
5. ALLOWANCE NO. 1
 - A. Unforeseen site conditions.
 - B. Additional Programming, License Additions, and other additions
At Owner's discretion, additional programming and licensing may be covered through the allowance.
6. ALLOWANCE NO. 2
 - A. Pre-negotiated Software Purchase.
 - Pricing for Rockwell Software products required for purchase, programming, and commissioning of the Wastewater SCADA System has been pre-negotiated with Rensenhouse. Contractor shall purchase the software included in the allowance.

End of Section



ALLOWANCE AUTHORIZATION

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

To: _____

Authorization Number: _____

Re: _____

From: _____

Date: _____

Contract For: _____

You are authorized to perform the following item(s) of work and to adjust the Allowance Sum accordingly:

This is NOT a CHANGE ORDER and does NOT INCREASE OR DECREASE the CONTRACT AMOUNT.

Original Allowance	\$ _____
Allowance Expenditures prior to this Authorization	\$ _____
Allowance Balance prior to this Authorization	\$ _____
Allowance will be [<input type="checkbox"/> increased] [<input type="checkbox"/> decreased] by this Authorization	\$ _____
New Allowance Balance	\$ _____

APPROVAL RECOMMENDED

CITY APPROVAL

Design Professional Date

City's Representative Date

CONTRACTOR ACCEPTANCE

Construction Manager Date

Contractor Date

Attachments:

- Distribution:
- City
 - Contractor
 - Construction Manager
 - Design Professional
 - Consultant
 - Other



APPLICATION FOR PAYMENT

Project Number 81000819/1712

Project Title Wastewater SCADA System Improvements Phase 2

Final Payment⁵

CONTRACTOR _____

Address _____

Application Number²: _____

Date: _____

Ordinance/Resolution Number: _____

Effective: _____

PO Number _____

Vendor Number _____

Application for Work Accomplished from _____ to _____

Original Contract Price	[1]		\$	-
Net by Change Orders through		[2]	\$	-
Current Contract Price (1+2)		[3]	\$	-
Completed Work	[4]	\$	-	
Disputed Amounts ³	[-]	[4a]	\$	-
Stored Material ⁴	[5]	\$	-	
Disputed Amounts ³	[-]	[5a]	\$	-
Total Completed and Stored to Date (4+5)		[6]	\$	-
Previous Payments	[7]	\$	-	
Previous Retainage	[8]	\$	-	
Total Previous Applications (7+8)		[9]	\$	-
Amount This Application (6-9)		[10]	\$	-
Less Retainage This Application (5%)		[-]	[11]	\$ -
Release of Retainage		[12]	\$	-
Total Due This Application (10-11+12)		[13]	\$	-
Liquidated Damages				
Completion of Work	[14]	\$	-	[-] \$ -
Prevailing Wage ⁷	[15]	\$	-	[-] \$ -
MBE/WBE Program ⁷	[16]	\$	-	[-] \$ -
Workforce Program ⁷	[17]	\$	-	[-] \$ -
Total Amount Due Contractor (13 - 14 through 17)		[18]	\$	-

Accompanying Documentation: ^{1, 2, 3, 4, 5, & 6} and any other information as necessary.

NOTE: Initial all figures on this Application and on the Schedule of Values that are changed to correct errors or conform to the amount recommended. Attach explanation of changes that have been made.

CONTRACTOR's Certification:

The undersigned CONTRACTOR certifies that (a) all previous progress payments received from OWNER on account of Work done under this Contract have been applied on account to discharge CONTRACTOR's legitimate obligations incurred in connection with Work covered by all prior Applications for Payment; (b) at time of payment, title of all Work, materials and equipment incorporated into said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Lien, security interest or encumbrance); and (c) all Work covered by this Application for Payment is in accordance with the Contract Documents and not defective; and (d) all manufactured goods or commodities used or supplied for this Project are in compliance with Kansas City's Buy America ordinance.

_____ By _____
 Contractor Authorized Representative (Print) Signature

Date _____

State of)
)SS
 County of)

Subscribed and Sworn to before me this _____ day of _____, _____.

My commission expires:

Notary Public: _____

DESIGN PROFESSIONAL's Recommendation of Payment:

In accordance with the Contract Documents, based on on-Site observations and the data comprising this application, the DESIGN PROFESSIONAL recommends to the OWNER that to the best of the DESIGN PROFESSIONAL's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the CONTRACTOR is entitled to payment of the Amount above listed in this application.

Name of firm (Print) DESIGN PROFESSIONAL (Print) (Signature)

Date: _____

Construction/Program Manager's Recommendation of Payment: (if applicable)

In accordance with the Contract Documents, based on on-Site observations and the data comprising this application, the Construction/Program Manager recommends to the OWNER that to the best of the Construction/Program Manager's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the CONTRACTOR is entitled to payment of the Amount above listed in this application.

Construction/Program Manager firm (Print) Authorized Representative (Print) (Signature)

Date: _____

City's Representative's Agreement with Recommendation of Payment

City's Representative(print) (Signature) (Date)

City's Approval

The amount previously recommended is approved for payment.

Director or Designee (Print) (Signature) (Date)

¹See General Conditions Article 14.02 A and B

²Proof of tax compliance if 1st payment and if Contract amount exceeds \$150,000.00

³Schedule of Values—Denote any amounts currently disputed in this application. Attach additional dispute documentation if required.

⁴If requesting payment for stored materials, see General Conditions Article 14.02 A.1

⁵If final payment, current proof of tax compliance if Contract is longer than 1 year and amount exceeds \$150,000.00.

⁶ Per General Conditions Sec. 14.02 attach a copy of the most recent 00485.01 M/WBE Monthly Utilization Report, 00485.02 Project Workforce Monthly Report and 00485.03 Company-Wide Workforce Monthly Report CONTRACTOR has submitted to the City's Human Relations Department

⁷Applicable only if final payment

REMINDER: CONTRACTOR is responsible for meeting or exceeding the the D/M/WBE participation amounts in its Contractor Utilization Plan (CUP) as amended by any previously approved Request for Modification/Substitution. Any Change Orders or amendments modifying the amount CONTRACTOR is to be compensated will have correspondingly impacted the amount of compensation due D/M/WBEs for purposes of meeting or exceeding the Bidder/Proposer participation. CONTRACTOR is again reminded to consider the effect of any Change Order or amendment, and to submit a Request for Modification/Substitution if appropriate.

Distribution: Owner Project Manager
 Contractor Design Professional
 Construction Manager _____



SCHEDULE OF VALUES

Project Number 81000819/1712

Project Title Wastewater SCADA System Improvements Phase 2

HRD APPROVED CUP		
MBE	WBE	DBE
\$0.00	\$0.00	\$0.00
%	%	%

A SPEC SECTION	B UNIT PRICE CONTRACTS			E DESCRIPTION OF WORK UNIT ITEM DESCRIPTION	F \$ UNIT PRICE	G NO. OF UNITS	H \$ TOTAL OR LUMP SUM	I UNITS COMPL ETE	J \$ COMPLETED WORK	K \$ STORED MATERIAL	L \$ TOTAL COMPLETED AND STORED TO DATE		M % J/H	O TOTALS TO DATE			Q % AT BOTTO M	R \$ TOTAL PREVIOUS APPLICATIONS	S \$ AMOUNT THIS APPLICATION L-R
	UNIT ITEM NO.	UNIT	ESTIMATED QUANTITY								\$ J+K	\$ MBE		\$ WBE	\$ DBE				



City Of Kansas City, Missouri

Certified Payroll Report Instructions

GENERAL INSTRUCTIONS:

Each space on the attached Certified Payroll Report requiring information is numbered. The numbers below correspond to those spaces. When completing the Certified Payroll Report, insert the required information in each space. The Certified Payroll Report **must be complete, clear and legible** and be accompanied by a completed Payroll Certification including **original signature**. All payrolls are to be submitted within two (2) weeks after the ending date of the payroll week.

The payroll form is available on line.

INSTRUCTION FOR PAYROLL SHEETS

1. **PAYROLL NUMBER:** Insert the number of the payroll. Payrolls start with number 1 (one) for the first week of work by each contractor or subcontractor. The numbers are then continuous until the last payroll. During weeks when no work takes place a payroll for that week showing no work is to be turned in. Revised payrolls must be designated with a letter "R" following the number. Check (✓) the box by the word "FINAL" after the number to indicate that no further work will be done by the contractor or subcontractor.
2. **WEEK ENDING:** On each sheet, insert the date of the last day of this payroll.
3. **SHEET OF:** On each sheet, insert the number of each sheet and the total number of sheets submitted.
4. **GRANT AGENCY PROJECT NO:** Insert the Grant Agency Project Grant Number if this is a grant funded project.
5. **CONTRACTOR:** Insert the contractor's company name and address.
6. **SUBCONTRACTOR:** If this is a payroll for a subcontractor, insert subcontractor's name and address. For the remainder of these instructions, the word "contractor" shall apply to both contractor and subcontractor.
7. **DEPARTMENT PROJECT or CONTRACT NO:** Insert Department's Project or Contract Number.
8. **LOCATION:** Insert location of work, including address, and county.
9. **DESCRIPTION:** Insert name of the project or contract from the Agreement.
10. **FEDERAL I.D. NUMBER:** Insert the contractor (10a) and subcontractor's (10b) Federal I.D. Number.
11. **EMPLOYEE NAME:** Insert employee's full legal name and complete home address. Make sure to include Apartment #'s and zip code.

12. **SOCIAL SECURITY NO.:** Insert employee's social security number (xxx-xx-xxxx).
13. **DATE:** Insert date for each day of the payroll week for each employee (mm/dd/yyyy).
14. **REGULAR HOURS*:** Insert the regular hours worked each day.
15. **OVERTIME HOURS*:** Insert the overtime hours worked each day.
16. **DOUBLE OVERTIME HOURS*:** Insert the double overtime hours worked each day.

***Note:** Numbers 14, 15, and 16: Make sure these **hours are equal to or greater than the hours turned in on the "Daily Labor Force Report" form**. Refer to the wage order for applicable overtime schedule.

If allowed by occupational title's applicable overtime rate, Contractor may make a permanent schedule transfer to an eight (8) or ten (10) hour day work week. **Advance written notification to and approval** from the Owner's Representative **is required**.

If allowed by the occupational title's applicable overtime rate, any change in the work week schedule due to inclement weather **must** be documented on the certified payroll.

17. **TOTAL HOURS:** Insert total of *regular hours* worked for the week on this project. (The total hours will calculate automatically if you are using the electronic form.)
18. **TOTAL HOURS:** Insert total of *overtime hours* worked for the week on this project. (The total hours will calculate automatically if you are using the electronic form.)
19. **TOTAL HOURS:** Insert total of *double overtime* hours worked for the week on this project. (The total hours will calculate automatically if you are using the electronic form.)
20. **TOTAL FRINGE HOURS:** Insert total Fringe Hours (by adding the amounts in 17, 18, and 19). (The total hours will calculate automatically if you are using the electronic form.)
21. **BASE RATE*:** Insert basic hourly rate of pay. Check the contract's "Annual Wage Order" or the "Federal General Wage Decision" section for basic hourly rate.
22. **OVERTIME RATE*:** Insert overtime rate of pay. Check the contract's "Annual Wage Order" or the "Federal General Wage Decision" section for the overtime rate.
23. **DOUBLE OVERTIME RATE*:** Insert double overtime rate of pay. Check the contract's "Annual Wage Order" or the "Federal General Wage Decision" section for the double overtime rate.
24. **FRINGE RATE*:** Insert fringe benefit rate for this project. Check the contract's "Annual Wage Order" or the "Federal General Wage Decision" section for the fringe benefit rate.

***Note:** *The total of the basic hourly rate plus the fringe benefit rate must be equal to or greater than the total of the basic hourly rate plus the fringe benefit rate found in the contract's "Annual Wage Order" or the "Federal General Wage Decision" section. If the contract contains both of the above, the higher rate will prevail.*

25. **TOTAL:** Multiply the amounts in 17 by 21 and insert here. (The total hours will calculate automatically if you are using the electronic form.)

26. **TOTAL:** Multiply the amounts in 18 by 22 and insert here. (The total hours will calculate automatically if you are using the electronic form.)
27. **TOTAL:** Multiple the amounts in 19 by 23 and insert here. (The total hours will calculate automatically if you are using the electronic form.)
28. **TOTAL:** Multiply the amounts in 20 by 24 and insert here. (The total hours will calculate automatically if you are using the electronic form.)
29. Check (✓) the box (☐) for the “*APPROVED PLAN*”, “*EMPLOYEE*”, or both indicating the Plan or manner in which the fringe benefit is paid. If fringe benefit is paid to both a Plan and the employee, then insert each amount that is paid to the Plan and/or the employee. If paid to a Plan, list the name(s) of Plan Programs on Payroll Certification page.

***Note:** 29a plus 29b **must equal** 28.

30. **OCCUPATIONAL TITLE/CLASSIFICATION:** Insert occupational title/classification of worker for each employee. Examples: Carpenter, laborer, electrician.
31. **GROUP:** Insert the group if, applicable for the occupational title/classification. Example: Operating Engineers Group I, II, III, IV or V.
32. **SKILL GROUP:** Insert skill group, if applicable. Example: general laborer, skilled laborer, first semi-skilled, second semi-skilled etc. or any of the listings under the federal classification such as painters.
33. **HOURS:** Insert total hours worked for all jobs for each employee during each payroll period.
34. **GROSS EARNINGS:** Insert employee’s gross earnings for each payroll period.
35. **FEDERAL:** Insert the amount of the deduction from each employee’s check stub.
36. **FICA:** Insert the amount of the deduction from each employee’s check stub.
37. **STATE:** Insert the amount of the deduction from each employee’s check stub.
38. **LOCAL E-TAX:** Insert the amount of the deduction from each employee’s check stub.
39. **MISCELLANEOUS:** Insert the amount of the deduction from each employee’s check stub.
40. **NET PAY:** Insert the employee’s net pay for each week.
41. **EARNINGS FOR THIS JOB:** Add the amounts in 25, 26, 27, and 29b and insert here.

***Note:** If fringe benefit is paid to Approved Plan, do not add the amount in 29a to this total.

42. **KANSAS CITY EARNINGS TAX THIS JOB:** Insert Kansas City Earnings tax deducted from employee’s check for this job.

Steps 11 through 42 are to be repeated for each employee working on the project site, or for the same employee working any additional Occupational Title/Classification.



CERTIFIED PAYROLL REPORT

Project Number:

Project Title:

Payroll Number: ①

Final

CONTRACTOR: ⑤	WEEK ENDING: ②	SHEET: ③	of	GRANT AGENCY PROJECT NO.: ④
ADDRESS:	SUBCONTRACTOR: ⑥			DEPT PROJECT OR CONTRACT NO.: ⑦
CITY, STATE ZIP:	ADDRESS:			LOCATION: ⑧
FEDERAL I.D. NUMBER: ⑩a	CITY, STATE ZIP:			DESCRIPTION: ⑨
	FEDERAL I.D. NUMBER: ⑩b			

EMPLOYEE NAME: ⑪	First Name	Last Name	DATE: ⑬	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:			REG. HRS: ⑭								17	\$ 21			\$ 25
CITY, STATE ZIP:			O.T. HRS: ⑮								18		\$ 22		\$ 26
SOCIAL SECURITY NO.: ⑫			D.O.T. HRS: ⑯								19		\$ 23		\$ 27
OCCUPATIONAL TITLE / CLASSIFICATION: ⑳						TOTAL FRINGE HOURS: ㉑			0.00						
			GROUP: ㉒			SKILL GROUP: ㉓						FRINGE PAID TO: ㉔			
												<input type="checkbox"/> APPROVED PLAN ㉕a <input type="checkbox"/> EMPLOYEE ㉕b			
WEEK ALL JOBS:	HOURS: ㉖	GROSS EARNINGS: ㉗	FEDERAL: ㉘	FICA: ㉙	STATE: ㉚	LOCAL E-TAX: ㉛	MISC: ㉜	NET PAY: ㉝	EARNINGS FOR THIS JOB: ㉞		\$ 41		KANSAS CITY EARNINGS TAX THIS JOB: ㉟		\$ 42

EMPLOYEE NAME:	First Name	Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:			REG. HRS:								0.00	\$ -			\$ -
CITY, STATE ZIP:			O.T. HRS:								0.00		\$ -		\$ -
SOCIAL SECURITY NO.:			D.O.T. HRS:								0.00		\$ -		\$ -
OCCUPATIONAL TITLE / CLASSIFICATION:						TOTAL FRINGE HOURS			0.00						
			GROUP:			SKILL GROUP:						FRINGE PAID TO:			
												<input type="checkbox"/> APPROVED PLAN <input type="checkbox"/> EMPLOYEE			
WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:		\$ -		KANSAS CITY EARNINGS TAX THIS JOB:		\$ -

EMPLOYEE NAME:	First Name	Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:			REG. HRS:								0.00	\$ -			\$ -
CITY, STATE ZIP:			O.T. HRS:								0.00		\$ -		\$ -
SOCIAL SECURITY NO.:			D.O.T. HRS:								0.00		\$ -		\$ -
OCCUPATIONAL TITLE / CLASSIFICATION:						TOTAL FRINGE HOURS			0.00						
			GROUP:			SKILL GROUP:						FRINGE PAID TO:			
												<input type="checkbox"/> APPROVED PLAN <input type="checkbox"/> EMPLOYEE			
WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:		\$ -		KANSAS CITY EARNINGS TAX THIS JOB:		\$ -

EMPLOYEE NAME:	First Name	Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:			REG. HRS:								0.00	\$ -			\$ -
CITY, STATE ZIP:			O.T. HRS:								0.00		\$ -		\$ -
SOCIAL SECURITY NO.:			D.O.T. HRS:								0.00		\$ -		\$ -
OCCUPATIONAL TITLE / CLASSIFICATION:						TOTAL FRINGE HOURS			0.00						
			GROUP:			SKILL GROUP:						FRINGE PAID TO:			
												<input type="checkbox"/> APPROVED PLAN <input type="checkbox"/> EMPLOYEE			
WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:		\$ -		KANSAS CITY EARNINGS TAX THIS JOB:		\$ -



CERTIFIED PAYROLL REPORT

Project Number: _____

Project Title: _____

Payroll Number: _____

Final

WEEK ENDING:		SHEET		of		GRANT AGENCY PROJECT NO.:		DEPT PROJECT OR CONTRACT NO.:								
CONTRACTOR:				SUBCONTRACTOR:				LOCATION:								
ADDRESS:				ADDRESS:				DESCRIPTION:								
CITY, STATE ZIP:				CITY, STATE ZIP:				FEDERAL I.D. NUMBER:								
FEDERAL I.D. NUMBER:				FEDERAL I.D. NUMBER:				FEDERAL I.D. NUMBER:								
EMPLOYEE NAME:		First Name	Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:				REG. HRS.								0.00	\$ -			\$ -
CITY, STATE ZIP:				O.T. HRS.								0.00	\$ -			\$ -
SOCIAL SECURITY NO.:				D.O.T. HRS.								0.00	\$ -			\$ -
OCCUPATIONAL TITLE / CLASSIFICATION:				TOTAL FRINGE HOURS								0.00			\$ -	\$ -
GROUP:				SKILL GROUP:										FRINGE PAID TO:	APPROVED PLAN EMPLOYEE	\$ -
WEEK ALL JOBS:		HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:		\$ -	\$ -	KANSAS CITY EARNINGS TAX THIS JOB		\$ -
			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -			\$ -	\$ -			\$ -
EMPLOYEE NAME:		First Name	Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:				REG. HRS.								0.00	\$ -			\$ -
CITY, STATE ZIP:				O.T. HRS.								0.00	\$ -			\$ -
SOCIAL SECURITY NO.:				D.O.T. HRS.								0.00	\$ -			\$ -
OCCUPATIONAL TITLE / CLASSIFICATION:				TOTAL FRINGE HOURS								0.00			\$ -	\$ -
GROUP:				SKILL GROUP:										FRINGE PAID TO:	APPROVED PLAN EMPLOYEE	\$ -
WEEK ALL JOBS:		HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:		\$ -	\$ -	KANSAS CITY EARNINGS TAX THIS JOB		\$ -
			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -			\$ -	\$ -			\$ -
EMPLOYEE NAME:		First Name	Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:				REG. HRS.								0.00	\$ -			\$ -
CITY, STATE ZIP:				O.T. HRS.								0.00	\$ -			\$ -
SOCIAL SECURITY NO.:				D.O.T. HRS.								0.00	\$ -			\$ -
OCCUPATIONAL TITLE / CLASSIFICATION:				TOTAL FRINGE HOURS								0.00			\$ -	\$ -
GROUP:				SKILL GROUP:										FRINGE PAID TO:	APPROVED PLAN EMPLOYEE	\$ -
WEEK ALL JOBS:		HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:		\$ -	\$ -	KANSAS CITY EARNINGS TAX THIS JOB		\$ -
			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -			\$ -	\$ -			\$ -
EMPLOYEE NAME:		First Name	Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:				REG. HRS.								0.00	\$ -			\$ -
CITY, STATE ZIP:				O.T. HRS.								0.00	\$ -			\$ -
SOCIAL SECURITY NO.:				D.O.T. HRS.								0.00	\$ -			\$ -
OCCUPATIONAL TITLE / CLASSIFICATION:				TOTAL FRINGE HOURS								0.00			\$ -	\$ -
GROUP:				SKILL GROUP:										FRINGE PAID TO:	APPROVED PLAN EMPLOYEE	\$ -
WEEK ALL JOBS:		HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:		\$ -	\$ -	KANSAS CITY EARNINGS TAX THIS JOB		\$ -
			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -			\$ -	\$ -			\$ -
EMPLOYEE NAME:		First Name	Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
ADDRESS:				REG. HRS.								0.00	\$ -			\$ -
CITY, STATE ZIP:				O.T. HRS.								0.00	\$ -			\$ -
SOCIAL SECURITY NO.:				D.O.T. HRS.								0.00	\$ -			\$ -
OCCUPATIONAL TITLE / CLASSIFICATION:				TOTAL FRINGE HOURS								0.00			\$ -	\$ -
GROUP:				SKILL GROUP:										FRINGE PAID TO:	APPROVED PLAN EMPLOYEE	\$ -
WEEK ALL JOBS:		HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:		\$ -	\$ -	KANSAS CITY EARNINGS TAX THIS JOB		\$ -
			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -			\$ -	\$ -			\$ -

Date _____

I, _____,
(Name of Signatory Party) (Title)
do hereby state:

(1) That I pay or supervise the payment of the persons employed by
(Contractor or subcontractor) _____
on the (Building or work) _____: that during the
payroll period commencing on the ____ day of ____, 20__, and ending the
____ day of ____, 20__, all said persons employed on said project have been
paid the full weekly wages earned, that no rebates have been or will be made either
directly or indirectly to or on behalf of said (Contractor or subcontractor) _____
_____ from the full weekly
wages earned by any person and that no deductions have been made either directly
or indirectly from the full wages earned by any person, other than permissible
deductions as defined in Regulations, Part 3 (29 CFR Subtitle A), issued by the
Secretary of Labor under the Copeland Act, as amended (48 Stat. 948.63 Stat. 108,
72 Stat. 967; 76 Stat. 357; 40 U.S.C. 276c), and described below:

(2) That any payrolls otherwise required under this contract to be submitted for the
above period are correct and complete; that the wage rates for laborers or mechanics
contained herein are not less than the applicable wage rates contained in any wage
determination incorporated into this contract; that the classifications set forth herein
for each laborer or mechanic conform to the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona
fide apprenticeship program registered with a State apprenticeship agency
recognized by the Bureau of Apprenticeship and Training, United States Department
of Labor, or if no such recognized agency exists in a State, are registered with the
Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:
(a) WHERE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR
PROGRAMS

In addition to the basic hourly wage rates paid to each laborer or mechanic listed
in the above referenced payroll, consisting of ____ pages, payments of fringe
benefits as listed in the contract have been or will be made to appropriate programs
for the benefit of such employees, exceptions noted in 4 (c) below.

(b) WHERE BENEFITS ARE PAID IN CASH

Each laborer or mechanic listed in the above referenced payroll, consisting of
____ pages, has been paid, as indicated on the payroll, in an amount not less than
the sum of the basic hourly wage rate plus the amount of the required fringe benefits
as listed in the contract, except as noted in Section 4 (c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION
REMARKS	

NAME AND TITLE	SIGNATURE
The willful falsification of any of the above statements may subject the contractor or subcontractor to civil or criminal prosecution. See Section 1001 of Title 18 Section 231 of Title 31 of the United States Code.	



SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project Number: 81000819/1712_____ Project Title: Wastewater SCADA System Improvements Phase 2 _____

From Contractor _____ To _____ Date _____

Spec. No.	Section Title	4	Firm, Address (Check box if Supplier)	Phone, FAX and e-mail	Contact

Attachments:

Signed by: _____ Date _____

Distribution: Owner Contractor Construction Manager Design Professional Consultant Other



DAILY LABOR FORCE REPORT

Project Number: 81000819/1712_____ Day _____ Date _____

Project Title: Wastewater SCADA System Improvements Phase 2_____

Contractor _____

Subcontractor _____

Weather: (Indicate if weather prevented work and why) _____

Shift: (circle) 5-8 hr Days 4-10 hr Days Other _____

* This report *MUST be completed and turned in* for EACH DAY until FINAL COMPLETION.

Worker's Full Legal Name	Occupational Title or Classification Group & Skill	Hours Worked & Time (i.e. 10AM - 4PM)	Race & Gender

I CERTIFY THAT ALL OF THE INFORMATION PROVIDED ABOVE IS TRUE AND COMPLETE.
Contractor/Subcontractor Representative:

Complete Name: (print) _____ Title: (print) _____

Signature: _____ Page ____ of ____

Distribution: City Department Contractor Subcontractor Other



CERTIFICATE OF SUBSTANTIAL COMPLETION

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

CONTRACT FOR: _____

CONTRACTOR: _____

DATE OF ISSUANCE: _____

PROJECT OR DESIGNATED PORTION SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Design Professional's and/or Construction Manager's best knowledge, information and belief, to be substantially complete. Substantial Completion is the state in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of Project or portion thereof designated above is hereby established as _____ which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

CONSTRUCTION MANAGER BY _____ DATE _____

DESIGN PROFESSIONAL BY _____ DATE _____

The Contractor will complete or correct the Work on the list of items attached hereto within _____ days from the above date of Substantial Completion.

CONSTRUCTION MANAGER BY _____ DATE _____

DESIGN PROFESSIONAL BY _____ DATE _____

The Owner accepts the Work or designated portion thereof as substantially complete and will assume full possession thereof at _____ (time) on _____ (date).

OWNER'S REPRESENTATIVE BY _____ DATE _____

- Distribution:
- Owner
 - Contractor
 - Construction Manager
 - Design Professional
 - Consultant _____
 - Other _____



PUNCH LIST

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

CONTRACTOR _____

From _____ Site Visit Date _____

The following items require the attention of the CONTRACTOR for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the CONTRACTOR to complete all Work in accordance with the Contract Documents.

Item No.	Location (Area)	Description	Correction/ Completion Date	Verification Check
----------	-----------------	-------------	-----------------------------	--------------------

Attachments

Signed by: _____ Date: _____

DESIGN PROFESSIONAL (Firm/In House)

- Distribution:
- OWNER
 - CONTRACTOR
 - DESIGN PROFESSIONAL
 - Consultant _____
 - Other _____



CONTRACTOR AFFIDAVIT FOR FINAL PAYMENT

Project Number _____

Project Title _____

STATE OF _____)
)SS
COUNTY OF _____)

The Undersigned, _____ of lawful
(Name)

age, being first duly sworn, states under oath as follows:

1. I am the _____ of _____ who is the general
(Title) (CONTRACTOR)
CONTRACTOR for the CITY on Project No. _____ and Project Title _____.

2. All payrolls, material bills, use of equipment and other indebtedness connected with the Work for this Project have been paid and all Claims of whatever nature have been satisfied, as required by the Contract.

3 (✓) ___ Prevailing wage does not apply; or

(✓) ___ All provisions and requirements set forth in Chapter 290, Section 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works projects have been fully satisfied and there has been no exception to the full and complete compliance with these provisions and requirements and the Annual Wage Order contained in the Contract in carrying out the Contract and Work. CONTRACTOR has fully complied with the requirements of the prevailing wage law as required in the Contract and has attached affidavits from all Subcontractors on this Project, regardless of tier, affirming compliance with the prevailing wage law as stipulated in the Contract.

4. I hereby certify that (a) at project completion and pursuant to contractor's final request for payment, contractor achieved (____%) Minority Business Enterprise (MBE) participation and (____%) Women Business Enterprise (WBE) participation on this contract, and (b) listed herein are the names of all certified M/WBE subcontractors, regardless of tier, with whom I, or my subcontractors contracted.

1. Name of MBE/WBE Firm _____
Address _____

Telephone Number (_____) _____
IRS Number _____
Area/Scope*of Work _____
Subcontract Final Amount _____

2. Name of MBE/WBE Firm _____
Address _____

Telephone Number (_____) _____
IRS Number _____
Area/Scope*of Work _____
Subcontract Final Amount _____

List additional subcontractors, if any, on a similar form and attach to the bid.

Supplier** Final Amount: _____

*Reference to specification sections or bid item number.

- (✓) ___ Met or exceeded the Contract utilization goals; or
- (✓) ___ Failed to meet the Contract utilization goals (attach waiver, substitution or modification); or
- (✓) ___ No goals applied to this Project.

5. CONTRACTOR certifies that each Subcontractor has received full payment for its respective work in connection with the Contract.

6. If applicable, I hereby certify that (1) at project completion and pursuant to contractor's final request for payment, contractor achieved, company-wide, at least ten percent (10%) minority workforce participation and two percent (2%) women workforce participation and (2) a true and accurate copy of my final project workforce monthly report is attached. **NOTE: This paragraph is only applicable if you completed a construction contract that was estimated by the City, prior to solicitation, as requiring more than 800 construction labor hours and costing in excess of \$300,000.00. If applicable you MUST attach copies of your final monthly workforce reports.**

7. This affidavit is made in behalf of the CONTRACTOR for the purpose of securing from Kansas City, Missouri, the certification of completion of the Project and receiving payment therefore.

8. If the Contract amount exceeded \$150,000, CONTRACTOR has submitted proof of compliance with the City tax ordinances administered by the City's Commissioner of Revenue and has on file proof of tax compliance from all Subcontractors. If the Contract term exceeded one (1) year, CONTRACTOR has provided proof of compliance with the City tax ordinances administered by the City's Commissioner of Revenue prior to receiving final payment and has on file proof of tax compliance from all Subcontractors prior to the Subcontractor receiving final payment from CONTRACTOR.

CONTRACTOR _____

By _____
(Authorized Signature)

Title _____

On this _____ day of _____, _____, before me appeared _____, to me personally known to be the _____ of the _____,

and who executed the foregoing instrument and acknowledged that (s)he executed the same on behalf of _____ as its free act and deed.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year first above written.

My commission expires:

Notary Public



SUBCONTRACTOR AFFIDAVIT FOR FINAL PAYMENT

Project Number _____

Project Title _____

STATE OF MISSOURI)

) ss:

COUNTY OF _____)

After being duly sworn the person whose name and signature appears below hereby states under penalty of perjury that:

1. I am the duly authorized officer of the business indicated below (hereinafter Subcontractor) and I make this affidavit on behalf of Subcontractor in accordance with the requirements set forth in Section 290.290, RSMo. Subcontractor has completed all of the Work required under the terms and conditions of a subcontract as follows:

Subcontract with: _____, Contractor

Work Performed: _____

Total Dollar Amount of Subcontract and all Change Orders: \$ _____

City Certified MBE WBE DBE NA
List certifications:

2. Subcontractor fully complied with the provisions and requirements of the Missouri Prevailing Wage Law set forth in Sections 290.210, RSMo through 290.340, RSMo.

Business Entity Type:

- Missouri Corporation
- Foreign Corporation
- Fictitious Name Corporation
- Sole Proprietor
- Limited Liability Company
- Partnership
- Joint Venture
- Other (Specify)

Subcontractor's Legal Name and Address

 Phone No. _____
 Fax: _____
 E:mail: _____
 Federal ID No. _____

I hereby certify that I have the authority to execute this affidavit on behalf of Subcontractor.

By: _____
 (Signature)

 (Title)

_____ (Print Name)
 _____ (Date)

NOTARY

Subscribed and sworn to before me this ____ day of _____, 20____.

My Commission Expires: _____ By _____

Print Name

Title

Section 01300 - SUBMITTAL PROCEDURES

1. SHOP DRAWINGS AND ENGINEERING DATA.

1.01. General. Shop Drawings and engineering data (submittals) covering all equipment and all fabricated components and building materials which will become a permanent part of the Work under this Contract shall be submitted to Engineer for review, as required. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and the operation of component materials and devices; the external connections, anchorages, and supports required; the performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

Each submittal shall cover items from only one section of the specification unless the item consists of components from several sources. Contractor shall submit a complete initial submittal including all components. When an item consists of components from several sources, Contractor's initial submittal shall be complete including all components. Contractor may submit separate submittals of the same specification with Engineer approval.

All submittals, regardless of origin, shall be approved by Contractor and clearly identified with the name and number of this Contract, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each copy of all submittals, regardless of origin, shall be stamped or affixed with an approval statement of Contractor. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

Contractor shall be solely responsible for the completeness of each submittal. Contractor's stamp or affixed approval statement of a submittal, per Figure 1-01300, is a representation to Owner and Engineer that Contractor accepts sole responsibility for determining and verifying all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto, and that Contractor has reviewed and coordinated each submittal with other Shop Drawings and with the requirements of the Work and the Contract Documents.

All deviations from the requirements of the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal using Figure 2-01300. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

Contractor shall submit all shop drawings electronically. Submittals made by any other method will be returned without review.

- A. Electronic Submittals: Electronic submittals, drawings, and the necessary data shall be submitted electronically to Engineer as specified below. Submittal documents shall be in color to facilitate use of red line markups. All electronic files shall be in Portable Document Format (PDF) as generated by Adobe Acrobat Professional Version 10.0, Bluebeam Revu Version 2015, or higher. The PDF file(s) shall be fully indexed using

the Table of Contents, searchable with thumbnails generated. PDF images must be at a readable resolution. For most documents, they should be scanned or generated at 300 dots per inch (dpi). Use of higher resolution is acceptable with Owner and Engineer approval. Optical Character Recognition (OCR) capture must be performed on these images so that text can be searched, selected and copied from the generated PDF file. The PDF documents shall have a bookmark created in the navigation frame for each major entry ("Section" or "Chapter") in the Table of Contents. Thumbnails shall be generated for each page or graphic in the PDF file.

The opening view for each PDF document shall be as follows:

Initial View: Bookmarks and Page

Magnification: Fit In Window

The file shall open to Contractor's transmittal letter, with bookmarks to the left. The first bookmark shall be linked to the Table of Contents.

PDF document properties shall include the submittal number for the document title and Contractor's name for the author.

Electronic submittal file sizes shall be limited to 50 MB. When multiple files are required for a submittal the least number of files possible shall be created.

Contractor shall post submittals and retrieve Engineer's submittal review comments through the Project website accessible through the Internet. Instruction on procedures for posting and retrieving submittals will be provided after award of the Contract. After Engineer's review, the Contractor shall post a final electronic version on the project's website and provide one (1) hard copy to the RPR within seven (7) days after the Engineer's review.

B. Hard Copy Submittals:

(a) Selected Submittals may be provided in paper ("hardcopy") copies only with advance approval of City, and using procedures specified herein.

(b) Equipment instruction books and operating manuals shall be provided in hardcopies in addition to specified electronic format.

The following is a list of documents that are to be submitted in electronic and hard copy formats:

1. Preliminary Project Schedule, submit one (1) copy.
2. Project Baseline Schedule, submit one (1) copy.
3. Each Progress Schedules, submit one (1) copy.
4. Each Project Recovery Schedules (as applicable), submit one (1) copy.

Facsimiles (fax) or E-mail submittals will not be acceptable. Submittals will not be accepted from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

1.02. Engineer's Review of Submittals. Engineer's review of submittals covers only general conformity to the Drawings and Specifications, external connections, and dimensions that affect the layout; it does not indicate thorough review of all dimensions, quantities, and details of the

material, equipment, device, or item covered. Engineer's review shall not relieve Contractor of sole responsibility for errors, omissions, or deviations in the drawings and data, nor of Contractor's sole responsibility for compliance with the Contract Documents.

Engineer's submittal review period shall be 28 consecutive calendar days and shall commence on the first calendar day following receipt of the submittal or resubmittal in Engineer's office.

When the drawings and data are returned with review status "NOT ACCEPTABLE" or "RETURNED FOR CORRECTION", the corrections shall be made as instructed by Engineer. The corrected drawings and data shall be resubmitted through the Project website. Resubmittals by facsimile or E-mail will not be accepted. When the drawings and data are returned with review status "EXCEPTIONS NOTED", "NO EXCEPTIONS NOTED", or "RECORD COPY", no additional copies need be furnished unless specifically requested by Engineer.

1.03. Resubmittal of Shop Drawings and Data. Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Engineer are provided on the resubmittal. Resubmittals shall be in an organized and consistent format.

When corrected copies are resubmitted, Contractor shall direct specific attention to all revisions in writing and shall list separately any revisions made other than those called for by Engineer on previous submittals. Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) or a unique identification that indicates the initial submittal and correct sequence of each resubmittal.

If more than one resubmittal is required because of failure of Contractor to provide all previously requested corrected data or additional information, Contractor shall reimburse Owner for the charges of Engineer for review of the additional resubmittals. This does not include initial submittal data such as shop tests and field tests that are submitted after initial submittal.

Resubmittals shall be made within 30 days of the date of the letter returning the material to be modified or corrected, unless within 14 days Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

The need for more than one resubmittal, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is the direct result of a change in the Work authorized by a Change Order or failure of Engineer to review and return any submittal to Contractor within the specified review period.

1.04. Color Selection. Contractor shall submit samples of colors and finishes for all accepted products before Engineer will coordinate the selection of colors and finishes with Owner. Engineer will prepare a schedule of finishes that includes the colors and finishes selected for both manufactured products and for surfaces to be field painted or finished and will furnish this schedule to Contractor within 60 days after the date of acceptance of the last color or finish sample.

2. OPERATION AND MAINTENANCE DATA AND MANUALS. Adequate operation and maintenance information shall be supplied for all equipment requiring maintenance or other

attention. The equipment Supplier shall prepare a Project specific operation and maintenance manual for each type of equipment indicated in the individual equipment sections or the equipment schedule. These requirements shall be in addition to any other related requirements of the Owner contained herein.

Unless otherwise agreed by Engineer, the operation and maintenance manual for each type of equipment shall only be submitted for review following completion of review of all shop drawings and engineering data pertaining to that equipment.

Parts lists and operating and maintenance instructions shall be furnished for other equipment not listed in the individual equipment sections or the equipment schedule.

Operation and maintenance manuals shall include the following:

- a. Equipment function, normal operating characteristics, and limiting conditions.
- b. Assembly, installation, alignment, adjustment, and checking instructions.
- c. Operating instructions for startup, routine and normal operation, regulation and control, shutdown, and emergency conditions.
- d. Lubrication and maintenance instructions.
- e. Guide to troubleshooting.
- f. Parts lists and predicted life of parts subject to wear.
- g. Outline, cross section, and assembly drawings; engineering data; and wiring diagrams.
- h. Test data and performance curves, where applicable.

The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered, or which may be required by Contractor.

Manuals shall be submitted in both hard copy and electronic format to Engineer prior to the date of shipment of the equipment as follows. Hard copies shall only be submitted for the final version and electronic versions shall be submitted for both preliminary and final versions. The manuals shall be submitted and Engineer's review comments retrieved, through the Project website accessible through the Internet. Instruction on procedures for posting and retrieving O&M submittals and review comments will be provided after award of the Contract. When the O&M manuals are returned with the review status "RETURNED FOR CORRECTION", the corrections shall be made as instructed by Engineer, and corrected manuals resubmitted to Engineer.

When review by Engineer is complete, three (3) copies of each electronic O&M manual shall be delivered on CD-ROM or USB hard drive and three (3) copies of each hard copy manual to Engineer. Each CD or USB hard drive shall contain only one copy of one manual. The completed O&M manual shall also be filed to the Project Website. Delivery of the final O&M shall be made 30 days prior to placing the equipment in operation.

All material shall be marked with Project identification, and inapplicable information shall be marked out or deleted.

Shipment of equipment will not be considered complete until all required manuals and data have been received.

If more than one resubmittal is required because of failure of Contractor to provide all previously requested corrected data or additional information, Contractor shall reimburse Owner for the charges of Engineer for review of the additional resubmittals. This does not include initial submittal data such as shop tests and field tests that are submitted after initial submittal.

2.01. Hard Copy Operation and Maintenance Manuals. Final hard copies of each manual shall be prepared and delivered in substantial, permanent, three D-ring or three-post binders with a table of contents and suitable index tabs.

2.02. Electronic Operation and Maintenance Manuals. Electronic manuals shall be in Adobe Acrobat's Portable Document Format (PDF), and shall be prepared at a resolution between 300 and 600 dots per inch (dpi), depending on document type. Optical Character Recognition (OCR) capture shall be performed on these documents. OCR settings shall be performed with the "original image with hidden text" option in Adobe Acrobat Exchange.

File size shall be limited to 50 MB. A single PDF file greater than 50 MB may only be submitted if acceptable to Owner. When multiple files are required the least number of files possible shall be created. File names shall be in the format OMXXXXX-YYYZ-V.pdf, where XXXXX is the five digit number corresponding to the specification section, YYY is a three digit O&M manual number, e.g. 001, Z is the letter signifying a resubmittal, A, B, C, etc., and V is a number used only when more than one 50 MB file is required for an O&M manual.

Documents prepared in PDF format shall be processed as follows:

1. Pages shall be searchable (processed for optical character recognition) and indexed when multiple files are required.
2. Pages shall be rotated for viewing in proper orientation.
3. A bookmark shall be provided in the navigation frame for each entry in the Table of Contents.
4. Embedded thumbnails shall be generated for each completed PDF file.
5. The opening view for PDF files shall be as follows:
 - Initial View: Bookmarks and Page
 - Page Number: Title Page (usually Page 1)
 - Magnification: Set to Fit in Window
 - Page: Single Page
6. Where the bookmark structure is longer than one page the bookmarks shall be collapsed to show the chapter headings only.
7. When multiple files are required the first file of the series (the parent file) shall list every major topic in the Table of Contents. The parent file shall also include minor headings bookmarked based on the Table of Contents. Major headings, whose content is contained in subsequent files (children) shall be linked to be called from the parent to the specific location in the child file. The child file shall contain bookmark entries for both major and minor headings contained in the child file. The first bookmark of any child file shall link back to the parent file and shall read as follows "Return to the

Equipment Name Table of Contents", e.g. Return to the Polymer Feed System Table of Contents.

8. Drawings shall be bookmarked individually, formatted for letter or 11x17 format.
9. Files shall be delivered without security settings to permit editing, insertion and deletion of material to update the manual provided by the manufacturer.

2.03. Labeling. As a minimum, the following information shall be included on all final O&M manual materials, including CD-ROM disks, jewel cases, and hard copy manuals, on covers and spines where applicable:

Equipment name and/or O&M title spelled out in complete words.

Project Name.

Owner Project/Contract Number.

Specification Section Number. Example: "Section 16345"

Manufacturer's name.

File Name and Date.

For example:

Medium-Voltage Vacuum Interrupter Switchgear Operation and Maintenance Manual

KCMO Wastewater SCADA System Phase 2

Project/Contract No. _____

Specification Section 16345

Manufacturer

OM16345-001.pdf, 5/05/2021

2.04 Record Documents. Record documents shall include any updates to buried utility coordinates.

End of Section

SUBMITTAL No. _____

SECTION _____

Do not combine multiple sections together unless required by specifications.

(Contractor's Letterhead)

SUBMITTAL IDENTIFICATION & CONTRACTOR'S APPROVAL STATEMENT

DATE: _____ COPIES _____ DRAWING SHEET NO. _____

Description submittal contents: _____

Location: _____

Manufacturer _____

Subcontractor or Supplier (Optional) _____

REMARKS: _____

CONTRACTOR'S APPROVAL

(_____ Construction Company _____) has reviewed and coordinated the submitted documentation and verifies that the equipment and material meet the requirements of the Work and the Contract Documents. We accept sole responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data contained in the submittal as required by the Contract Documents.

Deviations: None Yes (See attached Figure 2-01300 for written description)

Approved By: _____ Date: _____

This approval does not release subcontractor / vendor from the contractual responsibilities.

Black & Veatch

Project No. _____

Contract No. _____

Project Name: Wastewater SCADA System Improvements

SUBMITTAL No. _____

SECTION _____

Do not combine multiple sections together unless required by specifications.

(Contractor's Letterhead)

SUBMITTAL IDENTIFICATION & CONTRACTOR'S APPROVAL STATEMENT

DATE: _____ **COPIES** _____ **DRAWING SHEET NO.** _____

Description submittal contents: _____

Location: _____

Manufacturer _____

Subcontractor or Supplier (Optional) _____

DEVIATIONS

Black & Veatch

Project No. _____

Contract No. _____

Project Name: Wastewater SCADA System Improvements

WTR-SP-EN-01-33-00-F2, Rev 1, 2/27/2018

Reference Section [01300], Submittal Procedures

FIGURE 2-[01300]

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Project meetings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1, Section 01015, "Project Requirements" for multiple items including, but not limited to: Construction and Schedule Requirements, Progress Meetings, Communication Plan, Project Safety Plan, and Work Plan.
 - 2. Division 1, Section 01320, "Construction Progress Documentation" for preparing the Contractor's Construction Schedule.

1.02 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Closely coordinate construction with the Project Manager to ensure equipment is moved from the work area as construction proceeds.
- C. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Contractor/Bidder is responsible for coordinating site visits of all manufacturers and subcontractors necessary.
- E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Pre-construction conferences.
 - 7. Project closeout activities.
- F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.03 SUBMITTALS

- A. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.04 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within 7 days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Coordination of Work with Owner
 - e. Designation of responsible personnel.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for processing Applications for Payment.
 - h. Distribution of the Contract Documents.
 - i. Submittal procedures.
 - j. Preparation of Record Documents.
 - k. Use of the premises.
 - l. Responsibility for temporary facilities and controls.
 - m. Parking availability.
 - n. Office, work, and storage areas.
 - o. Equipment deliveries and priorities.
 - p. First aid.
 - q. Security.
 - r. Progress cleaning.
 - s. Working hours.
- C. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future

activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Access.
 - 6) Site utilization.
 - 7) Temporary facilities and controls.
 - 8) Work hours.
 - 9) Hazards and risks.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Change Orders.
3. Documentation of information for Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes administrative and procedural requirements for documenting the construction process beginning with the Notice of Intent to Contract and continuing through completion of the Work performed and Construction Contract close out. The Contractor shall submit all requested documentation electronically as specified in the Submittal Procedures Section or printed copies as directed. Refer to the Photographic Documentation Section for Construction photograph requirements.
- B. The Contractor shall furnish all labor, project management, materials, equipment, and incidentals as necessary to comply with these requirements including, but not limited to, the following:
 - 1. Submittals Schedule
 - 2. Preliminary Cost-Loaded Construction Schedule with OCCP Tasks.
 - 3. Contractor's Construction Schedule with OCCP Tasks.
 - 4. Operational Change Control Plan (OCCP) Form.
 - 5. Progress Schedule
 - 6. Daily Labor Force reports.
 - 7. Special Reports
 - 8. Construction photographs.
 - 9. Post-construction photographs.

1.02 DEFINITIONS

- A. Activity:
 - 1. A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 2. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 3. Predecessor activity is an activity that must be completed before a given activity can be started.
- B. Critical Path Method (CPM): A schedule network analysis technique used to determine the amount of scheduling flexibility (the amount of float) on various logical network paths in the project schedule network, and to determine the minimum total project duration. Early start and finish dates are calculated by means of a forward pass, using a specified start date. Late start and finish dates are calculated by means of a backward pass, starting from a specified completion date, which sometimes is the project early finish date determined during the forward pass
- C. Critical Path: Generally, but not always, the sequence of schedule activities determining the duration of the project. Generally, it is the longest path through the project. However, a critical path can end, as an example, on a schedule milestone that is in the

middle of the schedule model and that has a finish-no-later-than imposed date schedule constraint.

- D.Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet schedule milestones and contract completion date. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.
- F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G.Gantt Chart: A graphic display of schedule-related information. In the typical Gantt chart, schedule activities or work breakdown structure components are listed down the left side of the chart, dates are shown across the top and activity durations are shown as date-placed horizontal bars. Also known as a bar chart.
- H.Major Area: A significant construction element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Schedule Level: A project team specified rule for the relative granularity of schedule activities in an overall schedule model. Following are the descriptions and levels of detail for each schedule level:
 - 1. Level 1 - Project Summary Schedule: This is a summary level schedule that highlights major project activities, milestones and key deliverables.
 - 2. Level 2 - Project Phase Summary Schedule: This is a more extensive summary level schedule that includes all information from the Level 1 schedule and breaks down the project into major components by area or phase.
 - 3. Level 3 - Detail Schedule: This level will show detail plans to accomplish Procurement, Construction, Testing and Start-up. Such schedules will have logical relationships integrated between the activities and organized in such a manner to create a Critical Path and facilitate critical path analysis. It will include all milestones and major elements and will be used to support monthly progress reporting.
 - 4. Level 4 - Detail Schedule by Work Package: This level will include detailed information by each work package and display all activities to be accomplished by the workforce with durations of 7 or more calendar days. The Level 4 schedule can be developed for the entire project at one time or developed in 60 day time increments (Rolling Wave scheduling).
 - 5. Level 5 - Detailed Schedule by Task: This level of detail will support the short-term planning for the field, normally for those activities of less than 1-week duration. It is used for workforce supervisors to plan and coordinate work at the detail level.

- L. Work Breakdown Structure (WBS): A deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables. It organizes and defines the total scope of the project. Each descending level represents an increasingly detailed definition of the project work. The WBS is decomposed into work packages. The deliverable orientation of the hierarchy includes both internal and external deliverables. See also Schedule Levels.
- M. Work Package: A deliverable or project work component at the lowest level of each branch of the WBS. The work package includes the schedule activities and schedule milestones required to complete the work package deliverable or project work component.

1.04 SUBMITTALS

- A. Scheduler Qualifications: For firms and persons preparing schedules, submit qualifications within fourteen (14) days of date established for the Notice to Proceed to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of design professional and Owner, and other information specified.
- B. Submittals Schedule: Submit electronically and also one printed copy of the schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for each first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the work covered.
 - 6. Scheduled date for final approval.
- C. Preliminary Construction Schedule. Submit electronically and also one printed copy.
- D. Preliminary Network Diagram: Submit one printed copy large enough to show entire network for entire construction period.
- E. Contractor's Construction Schedule. Submit two printed copies and one electronic version of initial schedule, either blue- or black-line print, large enough to show entire schedule for entire construction period.
- F. CPM Reports. Concurrent with CPM schedule, submit electronically and also printed copies of the following computer-generated reports: activity report, logic report, and total float report. Format for each activity in reports shall contain activity number, activity description, original duration, revised duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
 - 1. Activity Report. List of all activities sorted by activity number and early start date, or actual start date, if known.

2. Logic Report. List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report. List of all activities sorted in ascending order of total float.

1.05 CONSTRUCTION PHOTOGRAPHS. Refer to the Photographic Documentation Section.

1.06 REPORTS

- A. Contractor shall submit the following reports electronically, and in paper copy, to Owner's web based document management tool as may be directed by the Owner:
 1. Daily labor force Reports: Submit report daily.
 2. Daily Construction Reports: Submit at weekly intervals.
 3. Material Location Reports: Submit at weekly intervals.
 4. Differing Field Condition Reports: Submit at time of discovery of differing conditions.
 5. Special Reports: Submit at time of unusual event.

1.07 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate Contractor's performing construction activities.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, estimated schedule of monthly payments, list of subcontracts, submittals schedule, progress reports, payment requests, and other required schedules and reports.
- C. Secure time commitments for performing critical elements of the work from parties involved.
- D. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- E. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to project site and use of temporary facilities.

1.08 TRAINING SCHEDULE

- A. Contractor shall provide a draft list of training sessions arranged in chronological order along with the submittal schedule.
- B. Contractor shall send an updated training schedule every 3 months, and Contractor shall indicate which training sessions are tentative or firmly scheduled.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

- A. Preparation. Provide a submittal schedule arranged in chronological order by date required by the construction schedule. Include time required for review, resubmittal,

ordering, manufacturing, fabrication, and delivery as set forth in the Contract Documents, when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, the estimated Schedule of Monthly Payments, and Schedule Requirements.
2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the work and those required early because of long lead time for manufacture or fabrication.
3. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

B. Submittal. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.02 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within fourteen (14) days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify each Monday of each week with a continuous vertical line. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the work.

C. Preliminary Network Diagram: ~~Submit diagram within 14 days of date established for the Notice to Proceed for review.~~ Outline significant construction activities for the project. To be submitted with the preliminary schedule.

2.03 SCHEDULE REQUIREMENTS

A. Procedures: Comply with procedures contained The American Association of Cost Engineers (AACE) recommended practices.

B. Time Frame: Extend project schedule from date established for the Notice to Proceed to not beyond the date of Final Completion.

C. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat separate major areas as a separate numbered activity for each principal element of the work.

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Owner.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

- E. Submittal Review Time: Include review and re-submittal times indicated in the Submittal Procedures Section. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
- F. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Owner's administrative procedures necessary for certification of Substantial Completion.
- G. Constraints: Include constraints and work restrictions indicated in the Construction Contract Documents and as follows in schedule, and show how the sequence of the work is affected.
- H. Phasing: Arrange list of activities on schedule by phase.
- I. Work under more than one contract or subcontract. Include a separate activity for each contract or subcontract.
- J. Work by Owner: Include a separate activity for each area of the work performed by Owner.
- K. Products Ordered in Advance: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.
- L. Area Separations: Identify each facility.
- M. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.04 PROGRESS SCHEDULE

- A. Contractor shall prepare the Construction Schedule using a CPM network analysis diagram.
- B. CPM Schedule Preparation: Prepare a list of all activities required to complete the work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery of materials and equipment.
 - d. Fabrication.
 - e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Sub-networks on separate sheets are permissible for activities clearly off the critical path. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
 - b. Establish procedures for monitoring and updating CPM schedule and for reporting progress monthly. Coordinate procedures with progress meeting and payment request dates.
 - c. Use "one calendar day" as the unit of time.
4. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
 - a. Contractor subcontractor and the work or activity.
 - b. Description of activity.
 - c. Principle events of activity.
 - d. Immediate preceding and succeeding activities.
 - e. Early and late start dates.
 - f. Early and late finish dates.
 - g. Activity duration in days.
 - h. Total float or slack time.
 - i. Average size of workforce.
5. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - a. Identification of activities that have changed added or deleted.
 - b. Changes in early and late start dates.
 - c. Changes in early and late finish dates.
 - d. Changes in activity durations in days.
 - e. Changes in the critical path.
 - f. Changes in total float or slack time.
 - g. Changes in the Contract Time.
6. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
 - a. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 - b. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 - c. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 - d. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - e. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.

- f. Submit value summary printouts one week before each regularly scheduled progress meeting.

C. Reports

1. Daily Labor Force Reports: Prepare a daily labor force report recording the following information concerning events at Project site:
 - a. List of subcontractors at Project site.
 - b. List of separate Contractor's at project site.
 - c. List of all the Contractor's and subcontractor's personnel showing hours worked in labor class at project site.
2. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
3. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Construction Contract Documents, prepare a detailed report. Submit electronically and directly to Owner with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Special Report

1. General: Submit special reports electronically and directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
2. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

2.05 CAUSES FOR EXTENSION OF TIME. Additional positive total Float in the Progress Schedule generated by efficiencies of Owner or Contractor is a shared commodity to be reasonably used by either party and belongs exclusively to the Project. Contractor is not entitled to any additional compensation for completion of the project prior to expiration of the Contract Times.

- A. Owner-Initiated Changes: Owner initiated changes to the Work that absorb Float time will not be considered for an extension of time. Owner-initiated changes that affect the critical path of the Progress Schedule shall be grounds for extending or shortening completion dates. Use of Float time for Contractor initiated changes will require Owner's concurrence. Contractor's changes, however, shall give way to Owner-initiated changes competing for the same Float time.
- B. Outside Contractor's Control: Events outside of Contractor's control that affect the critical path of the Progress Schedule will be considered for an extension or reduction of the Contract Times.

- C. Weather Delays: Engineer will obtain weather data during construction from a reputable source and will maintain weather records.

Engineer will determine Contractor’s entitlement to an extension of the Contract Times as a result of weather delays, based on the data included in Tables 1 and 2. Extensions of time will be granted at the discretion of Engineer for circumstances not covered by the Tables.

Any weather-related extension of Contract Times shall be non-compensable. Efficiencies gained as a result of favorable weather within a calendar month, where the number of days of normally anticipated weather days is less than expected, shall contribute to the project Float and shall not affect the Contract Times.

Application for a weather-related extension of time shall be submitted to Engineer, and shall state the extension requested and be supported by the relevant weather data.

Table 1 Average Monthly Precipitation (inches) 30-year average 1981 – 2010 NOAA National Data Center, Annual Summary											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.07	1.46	2.37	3.70	5.23	5.23	4.45	3.89	4.62	3.16	2.15	1.53

Table 2 Average Number of Calendar Days with Precipitation of 0.10 Inches or More in a Single 24-hour Period 8-year average 2010 – 2018 NOAA National Data Center, Global Summary of the Month											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	4	6	7	6	5	6	6	4	3	2

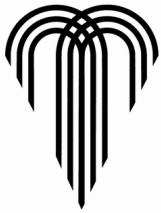
PART 3 - EXECUTION

3.01 CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or activity revision has been recognized or made at the direction by the Owner. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the work progresses, indicate actual completion percentage for each activity.
- B. Distribution: Upload electronic copy of schedules as specified in the Submittal Procedures Section. Distribute paper copies of approved schedule to Owner, Design Professional, Resident Project Representative, subcontractor's, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in performance of construction activities.

End of Section.



DAILY FIELD OBSERVATION REPORT

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

Contractor _____

Report Number _____ Date _____ Time _____

Weather

- Clear Snow
 Overcast Foggy
 Rain Cold

- Warm
 Hot
 Temperature Range _____

Site Conditions

- Clear Dusty
 Muddy _____
 Temperature Range _____

Day

- Monday Thursday
 Tuesday Friday
 Wednesday _____

Persons Contacted:

Work Observed:

Items Discussed:

Materials Delivered:

Requested Revisions or Interpretations:

Nonconforming Work Reported This Date To Contractor:

Remarks:

Attachments

Signed by:

Date:

- Distribution: Owner
 Contractor
 Construction Manager
 Design Professional
 Consultant _____
 Other _____



PERIODIC FIELD OBSERVATION REPORT

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

Contractor _____

Report Number _____ Date _____ Time _____

Weather

- Clear Snow
 Overcast Foggy
 Rain Cold

- Warm
 Hot
 Temperature Range _____

Site Conditions

- Clear Dusty
 Muddy _____
 Temperature Range _____

Day

- Monday Thursday
 Tuesday Friday
 Wednesday _____

Persons Contacted:

Work Observed:

Items Discussed:

Remarks:

Attachments

Signed by:

Date:

- Distribution: Owner
 Contractor
 Construction Manager
 Design Professional
 Consultant _____
 Other _____



WEEKLY REPORT OF WORKING DAYS

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

Contractor _____

Report Number _____ Week Ending: _____

DATE:	WORKING DAY	REMARKS		
TOTAL THIS WEEK	PREVIOUSLY	TOTAL TO DATE	WORKING DAYS IN CONTRACT	REMAINING OR OVERTIME

Signed by OWNER'S REPRESENTATIVE _____ Date: _____

Signed by CONTRACTOR _____ Date: _____

Distribution: OWNER CONTRACTOR Construction Manager Design Professional Consultant Other

SECTION 01329 - SAFETY PLAN

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the development and maintenance of a Construction Safety Plan.

1.02 REFERENCES

A. National Fire Protection Association (NFPA):

1. 70E - Standard for Electrical Safety in the Workplace.

B. Occupational Safety and Health Administration (OSHA).

C. Section 01300 Submittal Procedures.

1.03 CONSTRUCTION SAFETY PLAN

A. Detail the Methods and Procedures to comply with NFPA 70E, Federal, and Local Health and Safety Laws, Rules and Requirements for the duration of the Contract Times. Include reference to and comply with latest Owner safety policies. Include the following:

1. Identification of the Certified or Licensed Safety Consultant (Safety Officer) who will prepare, initiate, maintain and supervise safety programs, and procedures.
2. Procedures for providing workers with an awareness of safety and health hazards expected to be encountered over the course of construction.
3. Safety equipment appropriate to the safety and health hazards expected to be encountered during construction including hydrogen sulfide (H₂S), asbestos, and lead. Include warning devices, barricades, safety equipment in public right-of-way and protected areas, safety equipment used in multi-level structures, and personal protective equipment (PPE) as required by NFPA 70E.
4. Methods for minimizing employees' exposure to safety and health hazards expected during construction including entrance to tanks, such as digesters, and confined spaces used in the operation of the treatment plant and demolition.
5. Procedures for reporting safety or health hazards.
6. Procedures to follow to correct a recognized safety and health hazard.
7. Procedures for investigation of accidents, injuries, illnesses, and unusual events that have occurred at the construction site.
8. Periodic and scheduled inspections of general work areas and specific workstations.
9. Training for employees and workers at the jobsite.
10. Methods of communication of safe working conditions, work practices and required personal protection equipment.
11. Provision of a site-specific emergency action and evacuation plan during normal operations as well as when site access is blocked by trains.

B. Submit draft Safety Plan to Owner in accordance to Section 01300 Submittal Procedures for review prior to the Pre-Construction Meeting. The Safety Plan shall be a discussion topic on the agenda for the Pre-Construction Meeting. Following the Pre-Construction Meeting, Design-Builder shall submit final Safety Plan for Owner review within two weeks.

C. Design-Builder Assume assumes sole responsibility for every aspect of Health and Safety on the jobsite, including the health and safety of subcontractors, suppliers, and other persons on the jobsite:

1. Forward available information and reports to the Safety Consultant Officer who shall make the necessary recommendations concerning worker health and safety at the jobsite.
2. Employ additional health and safety measures specified by the Safety Consultant Officer, as necessary, for workers in accordance with OSHA guidelines.

D. Timely Transmit to Owner and Engineer copies of reports and other documents related to accidents or injuries encountered during construction in accordance with Section 01300 Submittal Procedures.

E. Smoking

1. There is no smoking allowed in buildings or within 50 feet of Digesters and NFPA classified areas and envelopes.
2. No smoking will be allowed in facilities once they are closed in.
3. No smoking will be permitted anywhere on the site following delivery of chemicals.
4. Smoking is only allowed in Owner designated areas.
5. Design-Builder shall provide signage identifying designated smoking areas, and when any changes to the designated areas are made.
6. Design-Builder will be responsible for cleaning up cigarette butts.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

End of Section



TRANSMITTAL LETTER

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

TO: _____ Date _____
 _____ Re: _____

ATTN: _____

We are sending you Attached Under separate cover via _____ the following items:
 Shop Drawings Prints Drawings Samples Specifications
 Copy of Letter Change Order _____

Copies	Date	No.	Description

These are transmitted as checked below:

For Approval Approved as Submitted Resubmit _____ Copies for Approval
 For Your Use Approved as Noted Submit _____ Copies for Distribution
 As Requested Returned for Corrections Return _____ Corrected Prints
 For Review and Comment _____

Remarks: _____

By: _____

Distribution: Owner
 Contractor
 Construction Manager
 Design Professional
 Consultant
 Other

Section 01335 - DOCUMENT MANAGEMENT

1. GENERAL.

1.01. Summary.

A. An internet-based coordination and document management system (DMS) will be used for the Project. This system will be used to manage project documentation among the City, Contractor, and Design Professional. The Contractor shall utilize this system for all project related correspondence and documentation.

B. The DMS will be used utilized to create, track and organize all project documentation, including, but not limited to, the following:

1. Schedules
2. Applications for Payment
3. Meeting minutes with action items
4. Project correspondence
5. Shop Drawing and Samples Submittals
6. Substitution Requests
7. Transmittals
8. Change Management
 - (a) Requests for Interpretation
 - (b) Requests for Proposal
 - (c) Work Change Directives
 - (d) Change Orders
9. Reporting
 - (a) Certified Payroll Report
 - (b) Subcontractors and Major Material Suppliers List
 - (c) Daily Labor Force Reports
 - (d) Daily Inspection Reports
 - (e) Photographs and Video
 - (f) Certificate of Achievement of Full Operation
 - (g) Contractor Affidavit for Final Payment
 - (h) Subcontractor Affidavit for Final Payment
 - (i) Punch Lists
10. Notifications
 - (a) Correction of Defective Work
 - (b) Notification of Non-Compliance

1.02 RELATED SECTIONS

- A. Section 01330 - Submittals
- B. Section 01015 – Specific Project Requirements

1.03 PRE-CONSTRUCTION COORDINATION MEETING.

A. The City will facilitate meeting with the Contractor to review requirements for project coordination, document control, and use of the DMS. The meeting should be scheduled at such a time to allow the Contractor to submit the initial project correspondence and preliminary schedules in accordance with Section 00700-General Conditions.

B. At this meeting, the City will present the procedures to be used for document management for the Project, and give the Contractor an opportunity to suggest modifications. The City will have sole responsibility for approving suggested modifications. During the meeting, focus will be given to workflows and tagging requirements.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

Section 01352 - SELECTIVE ALTERATIONS AND DEMOLITION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:
1. Cutting or modifying existing or new work.
 2. Partial demolition of structures.

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
1. A10.6 - Safety and Health Program Requirements for Demolition Operations.
- B. International Concrete Repair Institute (ICRI):
1. Guideline No. 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
 2. Guideline No. 310.3R - Guide for the Preparation of Concrete Surfaces for Repair Using Hydro Demolition Methods.

1.03 RELATED SECTIONS

- A. Section 00700 – General Conditions.
- B. Section 00800 – Supplementary Conditions.
- C. Section 01020 – Record Documents.
- D. Section 01140 – Work Restrictions.
- E. Section 01300 – Submittals.
- F. Section 01329 – Safety Plan.
- G. Section 01354 – Hazardous Material Procedures.
- H. Section 01566 – Cleanup Operations.

1.04 DEFINITIONS

- A. Chipping hammer: A hand-operated electrical or pneumatic demolition device for removal of hardened concrete or masonry materials having a weight of less than 15 pounds and an impact frequency of greater than 2,000 blows/minute.
- B. Concrete breaker: A hand-operated electrical or pneumatic demolition device for removal of hardened concrete or masonry materials having a weight greater or impact frequency less than the limits defined for a chipping hammer.
- C. Coring equipment: Non-impact rotary drill with diamond cutting edges.
- D. Heavy abrasive blast: Cleaning procedure by which various abrasives materials, or steel shot, are forcibly propelled by high pressure against a surface to remove loose material and produce a concrete surface roughened to ICRI Surface Profile CSP-7, or higher, as specified in ICRI 301.3R.
- E. Salvage materials: Materials removed from existing facility.

1.05 DESCRIPTION OF WORK

- A. The work includes partial demolition, cutting, and modifying of existing facilities, utilities, and/or structures.

- B. These facilities may be occupied and/or operational. Satisfactory completion of the work will require that the Contractor plan activities carefully to work around unavoidable obstacles and to maintain overall stability of structures and structural elements. It will further require restoration of existing facilities, utilities, and structures that are to remain in place and that are damaged by demolition or removal operations.

1.06 SUBMITTALS

- A. General:
 - 1. Submit as specified in Section 01300 - Submittals.
- B. Shop drawings include:
 - 1. Demolition Plan outlining the proposed sequence of events and procedures to be utilized for any demolition activities required as part of the Work. This plan shall include a plan for proper notification of Owner and other affected parties relative to the respective Work.
 - 2. The location of all embedded items shall be documented using diagrams and/or other media that clearly show dimensions and locations of existing structural elements, existing embedded items, and any new embedded items and their relationship to each other.
- C. Submittals for information only:
 - 1. Permits and notices authorizing demolition.
 - 2. Certificates of severance of utility services.
 - 3. Permit for transport and disposal of debris.
- D. Quality assurance submittals:
 - 1. Qualifications of non-destructive testing agency/agencies.
- E. Project record documents.
- F. Drawings and/or other media documenting locations of service lines and capped utilities.

1.07 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Assign relocation, removal, cutting, coring, and patching to trades and workers qualified to perform the Work in a manner that causes the least damage and that provides means of returning surfaces to an appearance at least equal to that of the surrounding areas unaffected by the Work.
 - 2. Non-destructive testing agencies shall have a minimum of 5 years' experience performing non-destructive testing for location of steel reinforcement in existing concrete under conditions that are similar to that required for this Work.

1.08 SEQUENCING

- A. Perform Work in sequences and within times specified in Section 01140 - Work Restrictions.
- B. If the facility or utility to be modified cannot be removed from service, perform the Work while the facility is in operation using procedures and equipment that do not jeopardize operation or materially reduce the efficiency of that facility.
- C. Coordinate the Work with operation of the facility:
 - 1. Do not begin alterations of designated portions of the Work until specific permission for activities in each area has been granted by Owner in writing.
 - 2. Engineer will coordinate the planned procedure with facility manager.

3. Complete Work as quickly and with as little delay as possible.
- D. Operational functions of the facility that are required to be performed to facilitate the Work will be performed by facility personnel only.
- E. Owner will cooperate in every way practicable to assist in expediting the Work.
- F. When necessary for the proper operation or maintenance of portions of the facility, reschedule operations so the Work will not conflict with required operations or maintenance.

1.09 REGULATORY REQUIREMENTS

- A. Dispose of debris in accordance with governing regulatory agencies.
- B. Comply with applicable air pollution control regulations.
- C. Obtain permits for building demolition, transportation of debris to disposal site and dust control.

1.10 PREPARATION

- A. Non-destructive evaluation of existing concrete and masonry:
 1. Prior to cutting, drilling, coring, and/or any other procedure that penetrates existing concrete [or masonry], retain and pay for the services of a qualified non-destructive testing agency to perform investigations to determine the location of existing steel reinforcement, plumbing, conduit, and/or other embedment's in the concrete.
 2. Submit documentation of the investigations to the Engineer for review and approval as specified in Section 01300 - Submittals before any work involving penetration of existing concrete is initiated.
- B. Obtain permission from adjacent property owners, including railroads, when outriggers, swinging cranes, and other equipment may have to traverse or extend into adjacent property.

1.11 PROJECT CONDITIONS

- A. Do not interfere with use of adjacent structures and elements of the facility not subject to the Work described in this Section. Maintain free and safe passage to and from such facilities or adequate barriers to prevent unsafe passage.
- B. Provide, erect, and maintain barricades, lighting, guardrails, and protective devices as required to protect building occupants, general public, workers, and adjoining property:
 1. Do not close or obstruct roadways without permits.
 2. Conduct operations with minimum interference to public or private roadways.
- C. Prevent movement, settlement, or collapse of structures adjacent services, sidewalks, driveways and trees:
 1. Provide and place bracing or shoring.
 2. Cease operations and notify Engineer immediately when safety of structures appears to be endangered. Take precautions to properly support structure. Do not resume operations until safety is restored.
 3. Assume liability for movement, settlement, or collapse.
 4. Promptly repair damage.
- D. Provide and arrange for capping and plugging utility services. Disconnect and stub off.
 1. Notify affected utility company in advance and obtain approval before starting demolition.
 2. Place markers to indicate location of disconnected services.
- E. Unknown conditions:

1. The drawings may not represent all conditions at the site and adjoining areas. Compare actual conditions with drawings before commencement of Work.
2. Existing utilities and drainage systems below grade are located on the Drawings based on information from existing documents and from surface facilities such as manholes, valve boxes, area drains, and other surface fixtures.
3. If existing active services encountered are not indicated or otherwise made known to the Contractor and interfere with the permanent facilities under construction, notify the Engineer in writing, requesting instructions on their disposition. Take immediate steps to ensure that the service provided is not interrupted, and do not proceed with the Work until written instructions are received from the Engineer.

PART 2 - PRODUCTS

2.01 SALVAGE MATERIALS

- A. No materials shall be designated for salvage.

PART 3 - EXECUTION

3.01 EXAMINATIONS

- A. Prior to beginning selective demolition operations, perform a thorough inspection of the facility and site, and report to the Engineer defects and structural damage to, or deterioration of existing construction to remain.
- B. Examine areas affected by the Work and verify the following conditions prior to commencing demolition:
 1. Disconnection of utilities as required.
 2. Utilities serving occupied or active portions of surrounding facilities will not be disturbed, except as otherwise indicated.
- C. If unsatisfactory conditions exist, notify the Engineer, and do not begin demolition operations until such conditions have been corrected.

3.02 PREPARATION

- A. General:
 1. Review Section 01354 – Hazardous Material Procedures, before beginning selective alterations and demolition work.
- B. Protection:
 1. Erect weatherproof closures to protect the interior of facilities and elements or equipment that are not designed for exposure to the weather. Provide temporary heat, cooling, and humidity control as necessary to prevent damage to existing and new construction. Maintain existing exiting paths and/or provide new paths in compliance with Building Code requirements.
 2. Erect and maintain dustproof partitions as required to prevent spread of dust, to other parts of building. Maintain negative pressure in the area where the Work is being performed to prevent the accidental spread of dust and to minimize the spread of fumes related to the Work.
 3. Upon completion of Work, remove weatherproof closures and dustproof partitions, and repair damaged surfaces to match adjacent surfaces.
 4. Provide and maintain protective devices to prevent injury from falling objects.

5. Locate guardrails in stairwells and around open shafts to protect workers. Post clearly visible warning signs.
 6. Cause as little inconvenience to adjacent building areas as possible.
 7. Protect landscaping, benchmarks, and existing construction to remain from damage or displacement.
 8. Carefully remove designated materials and equipment to be salvaged by Owner or reinstalled.
 9. Store and protect materials and equipment to be reinstalled.
- C. Layout:
1. The limits of selective demolition are indicated on the Drawings. Confine demolition operations within the limits indicated on the Drawings.
 2. Lay out demolition and removal work at the site and coordinate with related Work for which demolition and removal is required. Clearly mark the extent of structural elements to be removed on the actual surfaces that will be removed.
 3. Arrange for Engineer's inspection of the lay out extents.
 4. Do not begin demolition/removal operations until the lay out markings have been reviewed by the Engineer.

3.03 DEMOLITION

A. General:

1. Perform demolition work in accordance with ANSI A10.6.
2. Demolish designated portions of structures and appurtenances in orderly and careful manner in accordance with the Selective Demolition Plan.
3. Conduct demolition and removal work in a manner that will minimize dust and flying particles.
 - a. Use water or dust palliative when necessary to prevent airborne dust.
 - b. Provide and maintain hoses and connections to water main or hydrant.
4. Demolish concrete and masonry in small sections. Perform demolition with small tools as much as possible. Blasting with explosive charges is not permitted.
5. Sawcut concrete to establish the edges of demolition, wherever possible.
 - a. Do not use a concrete breaker within 6 inches of reinforcing or structural metals that are designated to remain.
 - b. At edges that are not sawcut, remove the final 6 inches of material with a chipping hammer as defined herein. At surfaces where material is removed with a chipping hammer, follow with a heavy abrasive blast to remove all loose material and microcracking.
 - c. Alternate techniques to remove concrete may be used if acceptable to the Engineer; however, techniques other than those deemed by ICRI Guideline No. 310.2R to provide a low risk of introducing microcracking will require a subsequent procedure to remove loose material.
 - d. Provide final surface preparation for concrete repairs as specified in Division 3 specifications.
6. At locations indicated on the Drawings that the existing reinforcing is to be preserved, remove concrete using methods that do not damage the reinforcing. Use one of the following techniques:
 - a. Hydro demolition techniques as outlined in ICRI Guideline No. 310.3R.

- b. Chipping hammer, as defined herein, followed by heavy abrasive blast to remove all loose material and microcracking at remaining surfaces impacted by the chipping hammer.
 - c. Alternate methods may be used, only if acceptable to the Engineer.
 - d. For all methods, provide a small, completed area for Engineer's review and acceptance. If the proposed method, in the opinion of the Engineer, damages the reinforcing, revise the removal method to remove the concrete with a less aggressive technique to protect the reinforcing.
 - 7. Remove materials carefully, to the extent indicated and as required.
 - a. Provide neat and orderly junctions between existing and new materials.
 - b. Use methods that terminate surfaces in straight lines at natural points of division.
 - 8. Do not remove anything beyond the limits of Work indicated without prior written authorization of the Engineer. If in doubt about whether to remove an item, obtain written authorization of the Engineer prior to proceeding.
 - 9. Perform work to provide the least interference and most protection to existing facilities to remain.
 - 10. Assume possession of demolished materials, unless otherwise indicated on the Drawings or specified.
 - a. Remove demolished materials from site at least weekly and dispose of in accordance with Laws and Regulations.
 - 11. Do not burn materials on site.
- B. Sizing of openings in existing concrete or masonry:
- 1. Make openings large enough to permit final alignment of pipe and fittings without deflections, but without oversizing.
 - 2. Allow adequate space for packing around pipes and conduit to ensure watertightness.
 - 3. If the Engineer deems the opening to be insufficient in size to accomplish these criteria, remove additional material using the procedures outlined in this Section.
- C. Cutting openings in existing concrete or masonry:
- 1. Do not allow saw cuts to extend beyond limits of openings.
 - 2. Create openings by the following method or other means acceptable to the Engineer that prevents over-cutting of member at corners:
 - a. Core-drill through slab or wall at corners, being careful not to damage materials beyond the area to be removed.
 - b. Saw cut completely through the member, between the core holes at the corners.
 - c. As an alternate to sawcutting through the member, score the edges of the opening with a saw to a 1-inch depth on both surfaces (when accessible).
 - (1) Remove concrete or masonry to within 6 inches of material to remain with a concrete breaker.
 - (2) Remove the remaining material with a chipping hammer.
 - d. Remove the remaining material at the corners left by the core-drilling with a chipping hammer.
 - 3. Prevent debris from falling into adjacent tanks or channels in service or from damaging existing equipment and other facilities.
- D. Pump out buried tanks. Remove tanks and service piping from site.

- E. Immediately upon discovery, remove and dispose of contaminated, vermin-infested, or dangerous materials using safe means that will not endanger health of workers and public.
- F. Rough grade areas affected by demolition.
- G. Remove demolished materials, tools, and equipment upon completion of demolition.

3.04 RESTORATION

A. General:

- 1. Repair damage caused by demolition to conditions equal to those that existed prior to beginning of demolition.
 - a. Patch and replace portions of existing finished surfaces that are damaged, lifted, and discolored with matching material. Refinish patched portion surfaces in a manner which produces uniform color and texture to entire surface.
 - b. When existing finish cannot be matched, refinish entire surface to nearest change of plane where angle of change exceeds 45 degrees.
- 2. The cost of repairs shall be at the Contractor's expense, and no increase in the Contract Price.
- 3. When new construction abuts or finishes flush with existing construction, make smooth transitions. Match finish of existing construction.
- 4. Where partitions are removed, patch floors, walls, and ceilings with finish materials that match existing materials.
- 5. Where removal of partitions results in adjacent spaces becoming one, rework floors, walls, and ceilings to provide smooth planes without breaks, steps, or bulkheads.
- 6. Where changes of plane exceed 2 inches, request instructions for making transition.
- 7. Trim and refinish existing doors as necessary to clear new floors.
- 8. Match patched construction with adjacent construction in texture and appearance so that patch or transition is invisible at 5-foot distance.
- 9. When finished surfaces are cut so that smooth transition is impossible, terminate existing surface in neat manner along straight line at natural line of division and provide appropriate trim.

B. Restore existing concrete reinforcement as follows:

- 1. Where existing reinforcement is to be incorporated into the new Work, protect, clean, and extend into new concrete.
- 2. Where existing reinforcement is not to be retained, cut off as follows:
 - a. At the removal line where new concrete joins existing concrete, cut reinforcement flush with concrete surface.
 - b. Where concrete surface at the removal line will become the finished surface, cut reinforcement 2 inches below the surface, paint ends with epoxy, and patch holes with dry pack mortar.

C. Restore areas affected by removal of existing equipment, equipment pads and bases, piping, supports, electrical panels, electric devices, and conduits such that little or no evidence of the previous installation remains:

- 1. Fill areas in existing floors, walls, and ceilings from removed piping, conduit, and fasteners with non-shrink grout and finish smooth.
- 2. Remove concrete bases for equipment and supports by:
 - a. Saw cutting clean, straight lines with a depth equal to the concrete cover over reinforcement minus 1/2 inch below finished surface.

- (1) Do not cut existing reinforcement on floors.
- b. Chip concrete within scored lines and cut exposed reinforcing steel and anchor bolts.
- c. Patch with non-shrink grout to match adjacent grade and finish.
- 3. Terminate abandoned piping and conduits with blind flanges, caps, or plugs.

3.05 FIELD QUALITY CONTROL

- A. Do not proceed with demolition without Engineer's inspection of lay out.
- B. Do not deviate from the submitted demolition plan without notifying the Engineer prior to Work.

END OF SECTION

SECTION 01354 – HAZARDOUS MATERIAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes procedures required when encountering hazardous materials, including asbestos and lead-based paint (LBP), at the Work site.

1.02 REFERENCES

- A. Occupational Safety and Health Administration (OSHA) United States Code of Federal Regulations (CFR) including, but not limited to:
 - 1. Title 29 - Labor:
 - a. 1910 – Occupational Safety and Health Standards
 - (1) 1910.1025 – Lead
 - (2) 1910.1001 – Asbestos
 - (3) 1910.1200 – Hazard Communication
 - b. 1926 – Safety and Health Regulations for Construction
 - (1) 1926.62 – Lead
 - (2) 1926.1101 – Asbestos
 - (3) 1926.65 – Hazardous waste operations and emergency response (HAZWOPER)
 - (4) 1926.59 – Hazard Communication
- B. United States Environmental Protection Agency (USEPA) including, but not limited to:
 - 1. Title 40 - Protection of Environment:
 - a. Part 61, Subpart M – National Emission Standard for Asbestos
 - b. Part 261 - Identification and Listing of Hazardous Waste
 - c. Part 763 – Asbestos
- C. Missouri Department of Natural Resources (MDNR):
 - 1. Revised Statutes of Missouri Title XL Additional Executive Departments
 - a. Chapter 643 – Air Conservation
 - (1) 225 – 265 – Asbestos Abatement and Asbestos Removal
- D. Society for Protective Coatings (SSPC):
 - 1. SSPC Guide 6 (SSPC-6) – Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations
 - 2. SSPC Guide 7 (SSPC-7) – Guide to Disposal of Lead-Contaminated Surface Preparation Debris

1.03 RELATED SECTIONS

- A. Section 00700 – General Conditions.
- B. Section 00800 – Supplementary Conditions.
- C. Section 01020 – Record Documents.
- D. Section 01140 – Work Restrictions.
- E. Section 01300 – Submittals.
- F. Section 01329 – Safety Plan.
- G. Section 01565 – Asbestos Abatement.

H. Section 01566 – Cleanup Operations.

1.04 SUBMITTALS

A. Hazardous Materials Management Plan (HMMP):

1. The HMMP will be submitted at least 10 days prior to the commencement of the Work and is the CONTRACTOR's comprehensive plan for the management of hazards encountered during the work, and should include:
 - a. Information about the CONTRACTOR's designated Certified Industrial Hygienist (CIH) per Part 1.05 of this Section and SECTION 01565.
 - b. Spill management procedures in the event of asbestos, lead or any other hazardous materials release.
 - c. Intended methods of hazardous materials removal, containment, and disposal, including description of engineering controls, personal protective equipment (PPE), and compliance monitoring.
 - d. Schedule and sequence of work for all hazardous materials work.
 - e. A copy of the Site-Specific Hazard Communication Plan in accordance with 29 CFR 1910.1200.
 - f. Copies of licenses, certifications, fit test records, medical surveillance records and notifications to handle and control hazardous materials, as applicable.

B. Submit laboratory reports, as applicable.

C. Refer to SECTION 01565 – ASBESTOS ABATEMENT for additional requirements.

1.05 DEFINITIONS

- A. Asbestos-Containing Material (ACM): Mill tailings or any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovation operations, this term also includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.
- B. Adequately Wet: Sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material (ACM), then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wetted.
- C. Competent Person: A trained worker capable of identifying existing and predictable asbestos hazards, perform exposure assessment and monitoring, is qualified to train other workers, and has the authority to take immediate corrective action to eliminate a hazardous exposure.
- D. Friable ACM (FACM): Any material containing more than 1 percent asbestos, that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
- E. Hazardous materials are those defined by 40 CFR 261 and State-specific codes.
- F. Lead: As defined by 29 CFR 1926.62, lead means metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.
- G. Non-friable ACM (NACM): Any material containing more than 1 percent asbestos, that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
 1. Category I NACM: Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos.

2. Category II NACM: Any material, excluding Category I NACM, containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- H. Regulated ACM (RACM): Any material that contains (a) FACM, (b) Category I non-NACM that has become friable, (c) Category I NACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II NACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material over the course of demolition or renovation operations. Category II NACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder in the course of work.

1.06 HAZARDOUS MATERIALS PROCEDURES

- A. When hazardous materials are encountered that were identified by existing reports prepared for WSD:
1. Prepare and initiate implementation of the HMMP, as detailed in Part 1.04 of this Section.
 2. Complete notifications to Federal, State and local agencies as required by applicable Laws and Regulations within the times stipulated by such Laws and Regulations.
 3. CONTRACTOR will designate a CIH, as required per Part 1.04 of this Section, to issue pertinent instructions and recommendations for protection of workers and other affected persons' health and safety.
 4. Identify and contact subcontractors and licensed personnel qualified to undertake storage, removal, transportation, disposal, and other remedial work required by, and in accordance with, applicable laws and regulations.
- B. When hazardous materials are encountered that were not identified by existing reports prepared for WSD:
1. Prepare and initiate implementation of the HMMP as detailed in Part 1.04 of this Section.
 2. Notify immediately OWNER, ENGINEER, and other affected parties.
 3. Complete notifications to Federal, State and local agencies as required by applicable Laws and Regulations within the times stipulated by such Laws and Regulations.
 4. CONTRACTOR will designate a CIH, as required per Part 1.04 of this Section, to issue pertinent instructions and recommendations for protection of workers and other affected persons' health and safety.
 5. Identify and contact subcontractors and licensed personnel qualified to undertake storage, removal, transportation, disposal, and other remedial work required by, and in accordance with, applicable laws and regulations.
- C. Forward to OWNER copies of reports, permits, receipts, and other documentation related to remedial work.
- D. CONTRACTOR will assume responsibility for worker health and safety, including health and safety of subcontractors and their workers.
1. Provide training to workers on recognition, reporting, and safety and health procedures required when hazardous materials are encountered, as relevant to the Work.
- E. File requests for adjustments to Contract Times and Contract Price due to the finding of previously unidentified hazardous materials at the Work site in accordance with Contract Documents.
1. CONTRACTOR and subcontractors will minimize delays by continuing performance of the Work in areas not affected by hazardous materials operations.

1.07 LEAD-BASED PAINT REMOVAL AND DISPOSAL

- A. Includes existing paint on the interior and/or exterior surfaces, per SSPC specifications, which may contain lead in concentrations which will require implementation of hazardous material compliance procedures as legislated by CFR Title 29 and Title 40.
- B. CONTRACTOR and/or its' subcontractors will collect samples of suspected LBP using the methods and frequencies prescribed by CFR Title 29 and Title 40 from the structures identified herein and have samples tested by a certified testing laboratory to determine lead content in samples.
 - 1. Collect a sufficient number of paint samples to provide adequate information regarding lead content in paint on the interior and/or exterior surfaces per SSPC specifications.
 - 2. Ensure that samples contain the total thickness of the paint to the substrate, where removed.
 - 3. Ensure that each sample contains a sufficient quantity of paint to facilitate proper and adequate analyses by testing laboratory.
 - 4. Ensure that samples are adequately identified with location from which it was removed.
- C. Laboratory testing will be completed in accordance with applicable testing standards by a National Lead Laboratory Accreditation Program (NLLAP)–certified laboratory.
 - 1. Submit 10 copies of complete laboratory analyses of paint samples.
- D. Prior to beginning the Work associated the removal, containment, and disposal of LBP and associated debris, prepare and submit to the OWNER 10 copies of the HMMP, as required by Part 1.04 of this Section. The HMMP will detail the following:
 - 1. Listing of LBP removal equipment to be used.
 - 2. Outline of procedures to be used to remove LBP.
 - 3. Data and specifications describing chemical stripping materials to be used, if applicable.
 - 4. Data and specifications describing abrasive blast materials and grit size to be used, if applicable.
 - 5. Description of planned LBP removal, hazardous waste debris containment, and hazardous waste disposal methods.
 - 6. Safety plan, consisting of a written plan of action covering operational requirements for safe removal of LBP, safe handling and containment of waste and debris generated by the operation, and safe disposal of hazardous waste and non-hazardous waste materials, complying with the most stringent requirements of the following:
 - a. Equipment and material manufacturer's safety sheets.
 - b. 29 CFR 1910.1025.
 - c. 29 CFR 1926.62.
 - 7. Certifications of personnel to perform work.
 - 8. Selection of an appropriately permitted disposal facility.
- E. Carry out LBP removal, containment, and disposal work in accordance with SSPC guidelines.
- F. Assume responsibility for the proper implementation of the LBP removal method selected. When abrasive blast cleaning is selected to remove LBP, comply with all applicable Federal, State, and local air quality, pollution, and environmental control regulations for blast cleaning. When chemical stripping is selected to remove the LBP, adhere to the chemical manufacturer's recommendations for the application of the product, the removal of the paint, and the containment of the debris.
- G. LBP removal work shall be performed by a Contractor having prior experience in the removal method selected and shall provide at least 5 references of similar projects completed, 3 of which must have been completed within the past 12 months, documenting their experience.
- H. Utilize a minimum of Class 3 containment and ventilation system, as described in SSPC-6, during LBP removal and containment procedures, as required for the conditions.
- I. Do not leave spent abrasive blast material, chemical stripping material, or LBP debris uncontained on the project site overnight.

- J. Test each container of paint debris, spent blast cleaning abrasive, chemical stripping debris, and other waste material generated by the operation to determine the waste material hazardous waste classification, as required by 40 CFR 261 and the selected disposal facility.
- K. Assume responsibility for the disposal of LBP waste and associated waste generated by the removal of the LBP and the preparation of the surfaces for recoating. Dispose in accordance with applicable Federal, State, local, and selected disposal facility requirements and regulations.
- L. Accurately complete the Uniform Hazardous Waste Manifest included at the end of SSPC-7. Indicate on the Manifest that the OWNER is the hazardous waste generator and obtain the OWNER's USEPA identification number for use in completing the Manifest.

1.08 ASBESTOS MATERIALS

- A. It is the specific intent of these Contract Documents to exclude from the Work any and all new products or materials containing asbestos. No products containing asbestos shall be incorporated in the Work.
- B. Refer to the list of reports prepared for WSD, referenced in Part 1.2 of this Section, identifying locations which may have ACM. The reports also designate the condition of the ACM in each location as either friable or non-friable.
- C. Asbestos abatement shall be executed as outlined in SECTION 01565 – ASBESTOS ABATEMENT of these Contract Documents.

PART 2 - PRODUCTS

PART 3 – EXECUTION

3.01 ASBESTOS MATERIALS

- A. Notifications:
 - 1. CONTRACTOR shall notify OSHA 24 hours prior to performing ACM removal operations.
 - 2. CONTRACTOR will provide written notification to USEPA Regional Asbestos NESHAP contact at least 20 working days prior to the start of the Work per SECTION 01565.
 - 3. CONTRACTOR shall notify MDNR at least 10 working days prior to the start of performing ACM removal operations.
 - 4. CONTRACTOR shall notify OWNER 3 working days in advance of commencing asbestos material removal operations.
- B. Work area:
 - 1. CONTRACTOR will establish a regulated work area, using at a minimum, construction warning tape to establish limits of work area for the asbestos material removal.
 - 2. On-site stockpiling or storage of ACM designated for disposal shall not be allowed.
- C. Safety:
 - 1. CONTRACTOR's safety plan will be provided as part of the HMMP (Part 1.02) and will detail requirements, as outlined in 29 CFR 1910.1001, 40 CFR 1926.1101 and 40 CFR 1926.65.
- D. Worker qualifications:
 - 1. Refer to SECTION 01565 – ASBESTOS ABATEMENT of these Contract Documents for qualifications for personnel performing asbestos abatement work.
- E. Legal disposal:
 - 1. Refer to SECTION 01565 – ASBESTOS ABATEMENT for asbestos disposal requirements.

End of Section

Section 01380 - PHOTOGRAPHIC DOCUMENTATION

1. CONSTRUCTION PHOTOGRAPHS BY CONTRACTOR. Contractor shall be responsible for the production of construction photographs as provided herein. Engineer shall designate the subject of each photograph.

A maximum of 50 pre-construction photographs of each work site, or pertinent features thereof, shall be taken after the utility locations have been marked, and prior to the commencement of Work and promptly submitted to Engineer. Under no circumstances shall construction begin until the pre-construction photographs have been received and approved. The same views shall be re-photographed upon completion of all construction activities and submitted with Contractor's application for final payment.

A minimum of 10 additional photographs of each work site shall be made each month throughout the progress of the Work at such times as requested by Engineer and submitted with Contractor's application for progress payment. Five of the photographs from the site shall be of erosion and sediment control features. Progress payments will not be processed without all photographs.

All photographs shall be used by the Owner and shall become the property of the Owner.

All photographs shall be color digital, produced by a professional photographer, as supplied by P-Tn or Owner approved equal, with 5 years' experience in construction photography. The photographer shall furnish a signed and notarized affidavit attesting to production of the original photographs and their authenticity.

Contractor shall submit the photographs electronically, uploaded to Owner's web-based document management tool as may be directed by the Owner. All photographs shall be color digital, in JPEG format, with a minimum pixel capacity of 8.0 megapixels. Photographs shall be taken at a minimum resolution of 3264 x 2448 and at "Best" quality. Digital images shall be provided with a descriptive index of the images. Images shall also be compiled on a CD, DVD, or flash drive. Label flash drive with the Project Name, contract number, name of Contractor, description and location of view, and date photographed.

Contractor shall also submit two (2) hard copy prints of each pre-construction and post-construction photograph. Prints shall be 4 by 5 inch. Prints shall be mounted on linen with flap for binding or enclosed in clear plastic binders and marked with the Project Name, contract number, name of Contractor, description and location of view, and date photographed.

Engineer will transmit the digital files and one copy of the prints to Owner.

End of Section

Section 01400 - QUALITY CONTROL

1. TESTING SERVICES. Testing services shall be provided in accordance with Paragraph 13.02 of the General Conditions. All tests to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to Engineer excluding testing as specified to be conducted directly by Contractor. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards.

Testing services provided by Owner are for the sole benefit of Owner and/or as required by the governing building code; however, test results shall be available to Contractor. Testing necessary to meet the requirements herein and satisfy Contractor's internal quality control procedures shall be the sole responsibility of Contractor.

1.01. Testing Services Provided by Contractor. Unless otherwise specified, Contractor shall provide all testing services in connection with the following:

Any Work (or part thereof) specifically to be inspected, tested or approved by an employee or representative of an Authority Having Jurisdiction. Contractor shall assume full responsibility for arranging and obtaining such inspections, tests or approvals. Contractor shall pay all costs associated for these activities and shall provide the required certificates of inspection or approval.

Any inspections, tests or approvals required for Owner or Engineer acceptance of materials or equipment to be incorporated in the Work. This includes any items required for acceptance of materials, concrete mix designs or equipment submitted for approval prior to Contractor's purchase for incorporation in the Work.

Testing, adjusting and balancing of electrical and other equipment and systems as specified to be incorporated into the Work. This includes services required by manufacturers of equipment or other products such as concrete repair products, pipe, coatings, linings and roof membranes furnished under the Contract Documents.

Any Work (or part thereof) required by the Contract Documents to be approved by Owner, Engineer or other designated individual or entity. Contractor shall assume full responsibility for arranging and obtaining such approvals, pay all costs in connection therewith and submit to Engineer the required certificates of approval.

Excluding those conducted directly by an Authority Having Jurisdiction or expressly specified to be conducted directly by Contractor, inspections and tests shall be performed by independent inspectors, approved agencies or other qualified individuals or entities acceptable to Owner and Engineer.

1.02. Testing Services and Special Inspections Provided by Owner. Unless otherwise specified, Owner shall employ and pay for the services of an independent testing laboratory, approved agency or other qualified individual or entities for inspections, tests or approvals required by the Contract Documents for field quality control. These include items indicated as Owner provided in the following:

Materials and equipment at the discretion of Owner.

01400 – Quality Control

Contractor shall provide access to the site and Work in accordance with Paragraphs 13.01 and 13.02 of the General Conditions. Contractor shall give timely notice of the readiness of the Work for inspection, tests or approvals and shall cooperate with the inspection and testing personnel to facilitate the required tests and inspections. Contractor shall furnish all sample materials and cooperate in the testing activities, including sampling. Contractor shall interrupt the Work when necessary to allow testing, including sampling, to be performed. Contractor shall have no Claim for an increase in Contract Price or Contract Times due to such interruption. When testing activities, including sampling, are performed in the field by Engineer or Agency personnel, Contractor shall furnish personnel and facilities to assist in the activities as required.

1.03. Transmittal of Test Reports. Written reports of tests and engineering data furnished by Contractor for Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.

The Approved Agency retained by Owner will furnish electronic copies of a written report of each test. Copies of each test report will be transmitted electronically within three (3) days after each test is completed or as directed by the Statement of Special Inspections as applicable.

2. OFFSITE INSPECTION. Inspection of materials or equipment during the production, manufacturing, or fabricating process, or before shipment, will be performed by Engineer or an independent testing firm or Approved Agency acceptable to Engineer as specified in the materials and equipment sections or 01450 Structural Tests and Special Inspections.

Except as otherwise specified in other sections, Contractor shall give appropriate written notice to Engineer not less than 10 days before offsite inspection services are required, and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.

The inspection organization will submit a written report to Engineer, with a copy to Contractor, at least once each week or as directed by the Statement of Special Inspections as applicable.

3. MANUFACTURER'S FIELD SERVICES. Manufacturer's field services shall be as specified herein except as specifically specified in the respective equipment sections.

3.01. Services Furnished Under This Contract. An experienced, competent, and authorized representative of the manufacturer of each item of equipment for which field services are indicated in the respective equipment section or in the equipment schedule section shall visit the Site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

Each manufacturer's representative shall furnish to Owner, through Engineer, a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the Contract Price.

End of Section

SECTION 01485 - CUTTING, CORING AND PATCHING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the cutting, coring, rough and finished patching of holes and openings. Holes and openings may be in existing construction, or in parts of new construction. Procedures for cutting and patching will be the same for either condition.
- B. All cutting, coring, and rough patching shall be performed by the Contractor. Finish patching shall be the responsibility of the Contractor and shall be performed by the trade associated with the application of the particular finish.
- C. Provide all cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the work to provide for installation of ill-timed or improperly scheduled work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed work as specified for testing.
 - 6. Provide penetrations of structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit.
 - 7. Provide penetrations of non-structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit. The determination of what is a nonstructural surface or material shall be made by the Engineer.
 - 8. Remove, install, or relocate materials or equipment.

1.02 RELATED WORK

- A. Concrete is included in Division 03.
- B. Pipe penetrations are included in Section 01490.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, a written request prior to executing any cutting or alteration which is not shown or detailed on the contract documents which affects or requires:
1. Cutting structural members.
 2. Holes drilled in beams or other structural members.
 3. Work of the Owner or any separate contractor.
 4. Structural value or integrity of any element of the project.
 5. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 6. Efficiency, operational life, maintenance or safety of operational elements.
 7. Visual qualities of sight-exposed elements.
- B. Request shall include:
1. Identification of the project.
 2. Description of affected work.
 3. The reason for cutting, alteration or excavation.
 4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of project.
 5. Description of proposed work:
 - a. Method and extent of cutting, patching, alteration, or excavation.
 - b. Trades who will execute the work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 6. Alternatives to cutting and patching.
 7. If the work is considered out of scope, provide a cost proposal.
 8. Confirmation of coordination with any separate contractor whose work will be affected.
 9. Related shutdown requests if required to do the work.
 10. Request for hot work permit if required to do the work.

- C. Submit written notice to the Engineer designating the date and the time the work will be uncovered.
- D. When a written request is required, do not proceed with the work until a written notice to proceed is received from the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Comply with specifications and standards for each specific product involved. Where there is no equivalent specification, the Contractor shall notify the Engineer who will provide a specification for the materials to be used.
- B. Concrete and grout for rough patching shall be as specified in Divisions 03.
- C. Materials for finish patching shall be equal to those of adjacent construction. Where existing materials are no longer available, use materials with equivalent properties and that will provide the same appearance. The materials are to be approved by the Engineer prior to their use.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with work until the Engineer has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Protect surrounding materials and equipment prior to starting work.
- C. Contain and control cooling liquids and slurry produced by the cutting and coring operations.
- D. When the cutting or coring will result in the structure or equipment being exposed to provide adequate weather protection.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work. When excavating in close proximity to piping, duct banks or other items subject to damage, use hand excavation.
- C. All equipment and workplace safety shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.
- D. Where possible, employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.
- E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- F. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.
- G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.
- H. Remove rubble and excess patching materials from the premises.

3.04 CORING

- A. All coring shall be performed in such a manner as to limit the extent of patching. Locate the rebar before coring to minimize cut throughs.
- B. Coring shall be performed with an approved non-impact rotary tool with diamond core drills.
- C. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.
- D. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- E. Fit to pipes and other penetrations in tanks to be water tight using seals or other methods defined in the specifications.

- F. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. All work shall be performed by mechanics skilled in this type of work.
- G. If holes are cored through floor slabs they shall be drilled from below where possible. If holes are drilled from above, provide protection and containment below the area being drilled to catch the plug and contain liquid and slurry.

3.05 CUTTING

- A. All cutting shall be performed in such a manner as to limit the extent of patching.
- B. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- C. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.
- D. Provide for control of slurry generated by sawing operation on both sides of wall and from below if cutting a floor.
- E. When cutting a reinforced concrete wall or floor, the cutting shall be done so as not to damage the bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
- F. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.
- G. Provide equipment of adequate size to remove cut panel.
- H. Saw cut concrete and masonry prior to breaking out sections.
- I. Install work at such time as to require the minimum amount of cutting and patching.
- J. All cutting of structural members shall be done in a manner directed by the Engineer.
- K. Cut opening only large enough to allow easy installation of the equipment, ducting, piping or conduit.
- L. When existing conduits or pipe sleeves are cut off at the floor line or wall line, they shall be filled with grout or suitable patching material.

3.06 PROTECTION

- A. Provide devices and methods to protect other portions of project from damage.
- B. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work.

C. Maintain excavations free from water.

3.07 PATCHING

- A. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown.
- B. Finish patching shall match existing surfaces as approved.
- C. Patching shall be of the same kind and quality of material as was removed.
- D. The completed patching work shall restore the surface to its original appearance or better.
- E. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed to include the joint between the existing material and the patch.
- F. Equipment damaged during cutting and patching shall be replaced or repaired by the equipment manufacturer, at the Engineer's sole discretion and at the expense of the Contractor doing the work.
- G. Repaint any damage to factory applied paint finishes using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted in accordance with the field painting requirements specified in Section 09902 at the expense of the Contractor doing the work.
- H. Slurry or tailings resulting from coring or cutting operations shall be contained and vacuumed or otherwise removed from the area following drilling or cut.
- I. Equipment shall be protected against mechanical and water damage during cutting and patching. Provide protective covers or use other means such as temporary relocation to protect equipment that is at risk of damage from the cutting and patching
- J. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

END OF SECTION

SECTION 01490 - PIPE PENETRATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install pipe penetration assemblies at all floor and wall penetrations as shown on the Drawings. This Section covers materials for the various pipe penetration configurations. Generally, penetration details are called out on the Drawings and referenced on the detail sheets. Where penetrations are required and not called out, it shall be assumed the most conservative penetration detail shown on the detail sheets shall be utilized as appropriate for the piping type, the wall or floor construction and the rating of the wall or floor penetrated.

1.02 SUBMITTALS

- A. Submit manufacturers' literature, installation instructions, and where applicable, fire rating and certified test results of the various components.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Unless otherwise shown all pipe sleeves shall be Schedule 40 galvanized steel pipe conforming to ASTM A53. Where indicated, provide a 2-in minimum circumferential water stop welded to exterior of sleeve at its midpoint. Ends of sleeves shall be cut and ground smooth and shall be flush with the wall or ceiling and extend 2-in above finished floors. Sleeves to be sealed with mechanical seals shall be sized in accordance with the seal manufacturer's recommendations. Sleeves to be sealed by caulking and sleeves for insulated piping shall be sized as required.
- B. For new walls only and for up to 20-inch pipe diameter, install molded non-metallic high density polyethylene sleeves (HDPE) with integral hollow, molded water-stop ring four inches larger than the outside diameter of the sleeve itself. Sleeve shall have end caps for forming and reinforcing ribs, and shall be domestically manufactured. Sleeves shall be Century-Line as manufactured by Pipeline Seal & Insulator, Inc., Houston, TX, or equal.
- C. For new walls only and for pipe diameters 20 to 60 inches, install molded HDPE modular interlocking discs to make the width of the wall. Discs shall be corrugated to prevent water migration between sleeve and concrete. Discs shall be domestically manufactured, Cell-Cast as manufactured by Pipeline Seal & Insulator, Inc., Houston, TX, or equal.
- D. External wall penetrations 36 -in diameter and less may be made by means of a ductile iron sleeve capable of being bolted directly to the formwork. Seal of the annular space between the carrier pipe and the sleeve shall be made by means of a confined rubber gasket and be capable of withstanding 350 psi. Sleeve shall have an integrally cast waterstop of 1/2-in minimum thickness, 2-1/2-in minimum height. Sleeves shall be by Omni-Sleeve, Malden, MA or equal.

2.02 WALL CASTINGS

- A. Unless otherwise shown, wall castings shall be ductile iron conforming to ANSI/AWWA A21.51/C151, thickness Class 53, diameter as required. Flanges and/or mechanical joint bells shall be drilled and tapped for studs where flush with the wall. Castings shall be provided with a 2-in minimum circumferential flange/waterstop integrally cast with or welded to the casting, located as follows: for castings set flush with walls located at the center of the overall length of the casting; for castings which extend through wall located within the middle third of the wall.

2.03 SEALING MATERIALS

- A. Mechanical seals shall consist of rubber links shaped to continuously fill the annular space between the pipe and the wall opening or sleeve. Link pressure plates shall be molded of glass reinforced nylon. Hardware shall be mild steel with a 60,000 psi minimum tensile strength and 2-part Zinc Dichromate coating per ASTM B-633 and Organic Coating, tested in accordance with ASTM B-117 to pass a 1,500-hour salt spray test. Type 316 Stainless Steel hardware shall be used in chemical areas, for submerged service and for penetrations in tanks containing sludge or wastewater. Links shall be colored throughout elastomer for positive material identification. Each link shall have permanent identification of the size and manufacturer's name molded into the pressure plate and sealing element. Completed sealing system shall be duty pressure rated for 20 psig differential pressure. Link material shall be EPDM for all services except fire rated assemblies, fire rated seals shall use silicone link material. Mechanical seals shall be PSI- Thunderline/Link-Seal as manufactured by Pipeline Seal & Insulator, Inc., Houston, TX, or pre- approved equal.
- B. Sealant shall be a two part foamed silicone elastomer by Dow Corning Co., Product No. 3-6548 silicone R.T.V.; 3M brand fire barrier products caulk C.P. 25 and 3M brand moldable putty MP+; or Flame-Safe fire stop systems FS-900 by Rectorseal. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.04 MISCELLANEOUS MATERIALS

- A. Bonding compound shall be Sikadur Hi-Mod epoxy by Sika Corp.; Euco 452 by Euclid Chemical Corp.; Master Builders Company or equal.
- B. Non-shrink grout shall be Masterflow 713 by Master Builders Co.; Euco NS by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Assemble and install components of pipe penetration assemblies as detailed on the Drawings.

END OF SECTION

SECTION 01565 - ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall provide the following:

1. All labor, materials, and incidentals as necessary to comply with these requirements and to remove all ACM as specified.
2. The equipment and safety provisions required for protecting workers while handling asbestos-containing material (ACM) except for respiratory protection.
3. The disposal of Regulated Asbestos Containing Materials (RACM). Disposal includes packaging of RACM. Disposal may be accomplished either by land filling at an appropriately permitted facility or converting RACM to non-Asbestos waste.
4. Obtaining permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements known to the OWNER and associated with codes, regulations, and standards. Obtain all necessary permits for disposal of ACM at no additional cost to the OWNER.

B. The Contractor shall comply with specifications herein and adherence to work practices, procedures and requirements set forth in all applicable Federal, State and local regulation. Applicable codes, regulations and standards take precedence, when available.

C. The Contractor shall coordinate all activities with Kansas City Missouri Air Quality Division (Health Department) as necessary.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all applicable Division Sections, apply to this section.

1.03 SUBMITTALS

A. Submit the following to the OWNER for review before starting work.

1. Certified Statement: Submit certified statement to be notarized-signed by an officer of the abatement contracting firm stating which exposure measurements, medical surveillance, and worker training records are being kept in conformance with 29 CFR 1926.
2. Copy of the CONTRACTOR's or subcontractors current Missouri State Registration for Asbestos Contractors issued by the Missouri Department of Natural Resources (MDNR).
3. Copy of State and/or local license for waste transport subcontractor.
4. Name and address of landfill where RACM are to be disposed. CONTRACTOR to include contact person and contact's telephone number.
5. Chain of Custody Form and Form of Waste Manifest proposed for use.
6. Sample of disposal bag and any added labels to be used.
7. Material Safety Data Sheet: Submit Material Safety Data Sheets, or equivalent, in accordance with the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200) for the following:
 - a. Surfactants
 - b. Encapsulants
 - c. Solvents
8. Surfactant: Submit product data, use instructions and recommendations from manufacturer of surfactant intended for use. Include data substantiating that material complies with requirements.

B. On a weekly basis, submit copies of all waste manifests and disposal tickets to OWNER.

C. Waste Shipment Record: Maintain a waste shipment record as required by the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation which indicates the waste generator, transporter, and disposal site; and describes the nature, size, type of container, and form of asbestos waste. Submit to OWNER within 30 days of departure from building.

- D. Submit for the OWNERs records, copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance to standards and regulations bearing upon performance of the Work including:
1. State and Local Regulations: Submit copies of codes and regulations applicable to the Work.
 2. Submit notices required by Federal, State and local regulations together with proof of timely transmittal to agency requiring the notice.
 3. Submit copies of current valid permits required by state and local regulations.
 4. Submit copies of all Federal, State and local licenses and permits necessary to carry out the Work.

1.04 CODES, REGULATIONS AND STANDARDS

- A. Except to the extent that more explicit or more stringent requirements are written directly into the Contract Documents, all applicable Federal, State and local codes and regulations have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies are bound herewith.
- B. The CONTRACTOR shall assume full responsibility and liability for the compliance with all applicable Federal, State and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The CONTRACTOR is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State and local regulations. The CONTRACTOR shall hold the OWNER and ENGINEER harmless for failure to comply with any applicable work, hauling, disposal, safety, health or other regulation on the part of the CONTRACTOR, the CONTRACTOR's employees, or subcontractors.
- C. Federal Requirements that govern asbestos abatement work, and transportation and disposal of asbestos waste materials include but are not limited to the following:
1. OSHA United States Code of Federal Regulations (CFR) including, but not limited to:
 - a. Title 29 – Labor:
 - (1) 1910 – Occupational Safety and Health Standards
 - (a) 1910.1001 – Asbestos
 - (b) 1910.132 – General Requirements
 - (c) 1910.134 – Respiratory Protection
 - (d) 1910.145 – Specifications for Accident Prevention Signs and Tags
 - (e) 1910.146 – Permit-Required Confined Spaces
 - (2) 1926 – Safety and Health Regulations for Construction
 - (a) Part 1926.1101 – Asbestos
 - (b) Part 1926.103 – Respiratory Protection
 - (c) Part 1926.95-107 – Personal Protective and Life Saving Equipment
 - (d) 1926.33 – Access to Employee Exposure and Medical Records
 - (e) 1926.59 – Hazard Communication
 - (f) 1926.20-35 – General Safety and Health Provisions
 - b. Title 49 – Transportation:
 - (1) Part 171 – General Information, Regulations, and Definitions
 - (2) Part 172 – Hazardous Materials Table, Special Provisions, hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans
 - (3) Part 171-180 – General Awareness and Training Requirements for Handlers, Loaders and Drivers, and Editorial and Technical Revisions
 2. United States Environmental Protection Agency (USEPA) including, but not limited to:
 - a. Title 40 – Protection of Environment:
 - (1) Part 763, Subpart G – Asbestos Worker Protection

- (2) Part 763, Subpart E – Asbestos Hazard Emergency Response Act (AHERA)
 - (3) Part 763, Subpart E, Appendix C – Asbestos Model Accreditation Plan (MAP)
 - (4) Part 61, Subpart A – National Emission Standards for Hazardous Air Pollutants, General Provisions
 - (5) Part 61, Subpart M – National Emission Standards for Hazardous Air Pollutants, National Emission Standard for Asbestos
3. State Requirements which govern asbestos abatement work or transportation and disposal of asbestos waste materials include, but are not limited to:
 - a. Missouri State Law – Chapter 643, Air Conservation
 - b. Missouri Code of State Regulations (CSR) – 10 CSR 10-6, Air Quality Standards, Definitions, Sampling and Reference Methods and Air Pollution Control Regulations for Entire State of Missouri.
 4. Abide by all local requirements which govern asbestos abatement work or hauling and disposal of asbestos waste materials.

1.05 NOTICES

A. USEPA

1. Postmark or Deliver Written Notification as required by USEPA NESHAP Asbestos Regulations (40 CFR 61, Subpart M) to the regional Asbestos NESHAP Contact at least 20 working days prior to beginning any work on asbestos containing materials (ACM). Send notification to the following address with a copy to WSD Project Manager:

Air Quality Program, Health Department
Suite 3000, 2400 Troost
Kansas City, Missouri 64108
(816) 983-4301
2. Include the following information in the notification sent to the Air Quality Program:
 - a. Indication whether the notification is the original or revised notification.
 - b. Name, address, and telephone number of Owner or operator.
 - c. Name, address, and telephone number of Contractor.
 - d. Type of Operation (demolition or renovation).
 - e. Description of the facility or affected part of the facility being demolished or renovated, including the size (square feet, number of floors), age, present and prior use of the facility.
 - f. Estimate of the approximate amount of RACM to be removed from the facility in terms of linear feet of pipe, and square feet of surface area for other facility components. Also estimate the approximate amount of Category I and Category II non-friable ACM (NACM) in the affected part of the facility that will not be removed before demolition.
 - g. For facilities in which the amount of friable asbestos materials is less than 260 linear feet on pipes and less than 160 square feet or 35 cubic feet if the length and width could not be measured. On other facility components, explain techniques of estimation.
 - h. Location and street address (including building number or name and floor or room number, if appropriate), city, county, and state of the facility being demolished or renovated.
 - i. Scheduled starting and completion dates of asbestos removal work (or any other activity, such as site preparation that would break up, dislodge, or similarly disturb asbestos material) in a demolition or renovation; planned renovation operations involving individual nonscheduled operations shall only include the beginning and

ending dates of the report period as described in paragraph (a)(4)(iii) of 40 CFR 61.145.

- j. Scheduled starting and completion dates of demolition or renovation.
 - k. Nature of planned demolition or renovation and method(s) to be used, including demolition or renovation techniques to be used and description of affected facility components.
 - l. Procedures to be used to comply with the requirements of NESHAP Asbestos Regulations (40 CFR 61 Subpart M).
 - m. Name and location of the waste disposal site where the asbestos containing waste material will be deposited.
 - n. A certification that at least one person trained as required by paragraph (c)(8) of 40 CFR 61.145 will supervise the stripping and removal described by this notification.
3. For emergency renovations described in paragraph (a)(4)(iv) of 40 CFR 61.145, the date and hour that the emergency occurred, a description of the sudden, unexpected event, and an explanation of how the event caused an unsafe condition, would cause equipment damage, or an unreasonable financial burden.
- a. Description of procedures to be followed in the event that the unexpected RACM is found or Category II NACM becomes crumbled, pulverized, or reduced to powder.
 - b. Name, address, and telephone number of the waste transporter.

1.06 STATE AND LOCAL AGENCIES

- A. Send written notification as required by State and local regulations prior to beginning any work on ACM.

1.07 PERMITS

- A. All ACM is to be transported by an entity maintaining a current "Industrial waste hauler permit" specifically for ACM, as required for transporting of waste ACM to a disposal site.
- B. CONTRACTOR is responsible for obtaining any demolition, building, renovation or other permits, and for paying application fees, if any, where required by State or Local jurisdictions.

1.08 LICENSES

- A. Licenses: Maintain current licenses as required by applicable Federal, State and/or local jurisdictions for the removal, transporting, disposal or other regulated activity relative to the Work in this contract.

1.09 POSTING AND FILING OF REGULATIONS

- A. Post all notices required by applicable federal, state and local regulations. Maintain two (2) copies of applicable federal, state and local regulations and standard. Maintain one copy of each at job site and one copy on file in Contractor's office.

1.10 WORKER TRAINING

- A. AHERA Accreditation: All workers are to be accredited Abatement Workers as required by the USEPA MAP Asbestos Abatement Worker Training (40 CFR Part 763, Subpart E, Appendix C).
- B. State and Local License: All workers are to be trained, certified and accredited as required by State of Missouri.
- C. Training - Class I: Complete in accordance with 29 CFR 1926.1101. Provide training for all workers who will perform Class I operations that is the equivalent in curriculum, training method and length to the USEPA MAP asbestos abatement worker training (40 CFR Part 763, Subpart E, Appendix C).
- D. Training - Class II Intact (Non-Friable): Provide training for workers who will be performing Class II work involving only the removal and/or disturbance of one generic category of building material, such as roofing materials, flooring materials, siding materials or cement asbestos panels, which includes at a minimum, the specific work practices and engineering controls which specifically relate to that category. Provide a course that includes "hands-on" training and takes at least 8 hours. Provide training that includes the elements set forth in 29 CFR 1926.1101(k) and the Compliance Directive CPL 2-2.63.
- E. Training - Class II Non-Intact (Friable): Provide training for workers who will be performing Class II work on materials that are friable or will become friable during the work that is the equivalent in

curriculum, training method and length to the USEPA MAP asbestos abatement worker training (40 CFR Part 763, Subpart E, Appendix C).

- F. Competent Person: Competent Person for work on removal of ACM must be trained as required by OSHA regulation 29 CFR 1926.1101(k)(9) and 1926.32(f); and as set forth in the Compliance Directive CPL 2-2.63 Appendix D page D-22 to D-23.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING

- A. General. Provide and require the use of protective clothing, to include coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos that exceed the total weight average (TWA) and/or excursion limit prescribed by 29 CFR 1926.1101 or for which a required negative exposure assessment is not produced, and for any employee performing Class I operations which involve the removal of over 25 linear or 10 square feet of thermal system insulation (TSI) or surfacing ACM or presumed ACM.
- B. Coveralls: Provide disposable full-body coveralls and disposable head covers. Contractor will require that they be worn by all workers in the Work Area. Provide a sufficient number for all required changes, for all workers in the Work Area.
- C. Additional Protective Clothing: Provide each worker with the protective clothing as required by Federal, State and local regulations, including but is not limited to, hardhats, cold weather gear, gloves, boots and goggles.
- D. Disposable coveralls, head covers, and footwear covers shall be provided by the Contractor for the Owner, Engineer and other authorized representatives who may inspect the job site as needed.

2.02 MATERIALS

- A. Provide 6-millimeter (mil) thick leak-tight polyethylene disposal bags with three labels showing the following text. **Peel and stick type labels are prohibited.**
 - 1. First Label: Provide in accordance with 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard:
"DANGER CONTAINS ASBESTOS FIBERS AVOID CREATING DUST CANCER AND LUNG DISEASE HAZARD BREATHING AIRBORNE FIBERS IS HAZARDOUS TO YOUR HEALTH".
 - 2. Second Label: Provide in accordance with U. S. Department of Transportation regulation on hazardous waste marking. 49 CFR parts 171 and 172. Hazardous Substances
"RQ-ASBESTOS WASTE CLASS 9 NA2212-PG III".
 - 3. Third Label: Provide the name of the waste generator (Owner's name), the location from which the waste was generated and the names and addresses of the transporter. This label must be durable, able to repel dirt and moisture (e.g., permanent marker). Label must be placed directly on disposal bag(s) in a legible format.
- B. Polyethylene Sheet: Provide flame resistant polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 6-mil thick, frosted or black as indicated.
- C. Duct Tape: Provide duct tape in 2-inch or 3-inch widths as indicated, with an adhesive which is formulated to stick firmly to sheet polyethylene.
- D. Spray Cement: Provide spray adhesive in aerosol cans which is specifically formulated to stick firmly to sheet polyethylene.
- E. Fiberboard Drums: Provide heavy duty leak tight fiberboard drums with tight sealing locking metal tops.
- F. Paper board Boxes: Provide heavy duty corrugated paper board boxes coated with plastic or wax to retard deterioration from moisture. Provide in sizes that will easily fit in disposal bags.

PART 3 – EXECUTION

3.01 GENERAL

01565 – 5 of 8

Revised 06/03/21

Kansas City, Missouri
Water Services Department
Birmingham Pump Station Screen Replacement

A. Worker Protection

1. Provide worker protection as required by the most stringent OSHA and/or USEPA standards applicable to the Work. The following procedures are the minimum standards to be adhered to regardless of asbestos fiber count in the Work Area.
2. Each time the Work Area is entered remove all personal clothes in designated Changing Room provided by Contractor, and put on new disposable coverall, new head cover, and a clean respirator. Proceed through shower room to equipment room and put on work boots.
3. Warning Signs: Near the Work Area a sign complying with requirements of the USEPA NESHAP regulation (40 CFR Part 61) shall be visible in a manner and location that a person can read the following:
“DANGER ASBESTOS CANCER AND LUNG DISEASE HAZARD AUTHORIZED PERSONNEL ONLY RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA”.

B. Transportation and Disposal of RACM

1. All waste is to be transported by a waste transportation contractor or subcontractor with all required licenses from all state and local authorities with jurisdiction.
2. Mix all liquid ACM waste with a blendable material so that it forms a blendable (non-liquid) form and have the concurrence of the landfill operator prior to disposal.
3. Load all adequately wetted RACM in disposal bags or leak-tight containers. All materials are to be contained in one of the following:
 - a. Two 6-mil disposal bags; or
 - b. Two 6-mil disposal bags and a fiberboard drum; or
 - c. Sealed steel drum with no bag.
4. Protect interior of truck or dumpster with critical and primary barriers, as required by authorities having jurisdiction.
5. Carefully load containerized waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport, to ensure that no unauthorized persons have access to the material.
6. Warning Signs: During loading and unloading mark dumpsters, receptacles and vehicles with a sign to comply with requirements of the USEPA NESHAP regulation (40 CFR Part 61), in a visible location that reads:
“DANGER ASBESTOS DUST HAZARD CANCER AND LUNG DISEASE HAZARD AUTHORIZED PERSONNEL ONLY”
7. Do not store containerized materials outside of the Work Area. Take containers from the Work Area directly to a sealed truck or dumpster.
8. Do not transport disposal bagged materials on open trucks. Label drums with same warning labels as bags. Uncontaminated drums may be reused. Treat used drums that have been contaminated as RACM and dispose of in accordance with this specification.
9. Advise the landfill operator or processor, at least ten days in advance of transport, of the quantity of ACM to be delivered.
10. At disposal site unload containerized waste:
 - a. At a disposal site, sealed plastic bags may be carefully unloaded from the truck. If bags are broken or damaged, return to work site for rebagging. Clean entire truck and contents using procedures set forth under Project Decontamination.
11. Retain receipts from landfill or processor for amount of ACM disposed.
12. At completion of hauling and disposal of each load, submit copy of waste manifest, chain of custody form, and landfill receipt to Owner.

3.02 SEQUENCING

A. Isolate air intakes

1. Shut down air handling units that draw in fresh air from any area within 30 feet of the Work Area. Seal all air intakes with 6-mil plastic sheeting.

2. Provide horizontal or vertical extension to relocate the opening of air intakes outside or above the Work Area.
- B. Install critical barriers over all openings into building or equipment within 30 feet of the Work Area. Do not cover building surfaces. Erect temporary screens of reinforced plastic sheeting as required to prevent wind carrying products of work to any entries of the building or other occupied portions of the site.
- C. Do not sand, abrade or grind asbestos containing materials.
- D. Airborne Fiber Levels: Maintain airborne fiber levels as set forth herein.
- E. Use Manual methods which do not render asbestos containing materials “non-intact.” These include the use of spud, spade, flat-blade or slicing tools, such as axes, mattocks, pry bars, spud bars, crow bars, shovels, flat-blade knives, and utility knives, to slice, cut, strip-off, shear-under, or pry up the material.
- F. Remove ACM in an intact state to the extent feasible.
- G. Perform all removal work on non-intact ACM using wet methods, or that which will be rendered non-intact during removal, unless wet methods are not feasible or will create safety hazards.
 1. For removal of ACM in outside conditions, perform all removal work on non-intact asbestos containing materials when outside temperatures are warm enough that the ACM is above the phase change (glass) point. Carryout removal of ACM in a manner that will minimize pulverizing, breaking or abrading of involved materials.
 2. Wet surface with amended water. Use sufficient water to completely wet surface but not cause ponding or running of water. Cut into sections able to fit in disposal boxes as applicable. Use rotary blade to cut. Do not saw or use powered rippers. Lift sections and place in disposal boxes as applicable. Use a high-efficiency particulate air (HEPA) vacuum or wet sweep into sweep shovels to pick up debris as applicable. Bag and dispose of as specified herein.
 3. For insulation, wet insulation with amended water sufficiently to enable it to be removed in a crumbly damp mass. Remove by scraping with hoes. Dispose of insulation as a non-asbestos waste.
- H. When removing with a power cutter:
 1. Continuously mist the blade of the cutting machine during use unless the competent person determines that misting substantially decreases worker safety.
 2. Collect dust and debris resulting from the cutting operation:
 - a. Aggregate Surface: Collect all dust resulting from the cutting operation with a HEPA dust collector or by HEPA vacuuming along cut line.
 - b. Smooth Surface: Collect all dust resulting from the cutting operation with a HEPA dust collector, by HEPA vacuuming along cut line, or by gently sweeping and then carefully and completely wiping up the wetted dust and debris left along the cut line.
 3. Immediately bag dust and debris resulting from the cutting operation or place in covered containers.
- I. Intact ACM shall be removed from Work Area as soon as it is practical, but no later than the end of the work shift.
- J. ACM that is non-intact shall be removed from the Work Area as soon as it is practical, but in any event no later than at the end of the work shift. Non-intact ACM remaining in the Work Area will be kept wet, and placed in an impermeable waste bag, or wrapped in plastic sheeting.

3.03 DECONTAMINATION PROCEDURES

- A. Require all workers to adhere to the following personal decontamination procedures at a minimum whenever they leave the Work Area:
 1. Type B or C Supplied Air or Powered Air-Purifying Respirators (PAPR):
 - a. When exiting area, remove disposable coveralls, disposable head covers, and disposable footwear covers or boots in the equipment room.

- b. Still wearing respirators, proceed to showers. Showering is mandatory. Care must be taken to follow reasonable procedures in removing the respirator to avoid asbestos fibers while showering. The following procedure is required at a minimum:
 - (1) Thoroughly wet body including hair and face. If using a PAPR hold blower unit above head to keep canisters dry.
 - (2) With respirator still in place thoroughly wash body, hair, respirator face piece, and all parts of the respirator except the blower unit and battery pack on a PAPR. Pay particular attention to seal between face and respirator and under straps.
 - (3) Take a deep breath, hold it and/or exhale slowly, completely wet hair, face, and respirator. While still holding breath, remove respirator and hold it away from face before starting to breath.
 - (4) Carefully wash face piece of respirator inside and out.
 - c. If using PAPR, shut down in the following sequence:
 - (1) Cap inlets to filter cartridges, and then turn off blower unit (this sequence will help keep debris which has collected on the inlet side of filter from dislodging and contaminating the outside of the unit). Thoroughly wash blower unit and hoses. Carefully wash battery pack with wet rag. Be extremely cautious of getting water in battery pack as this will short out and destroy battery.
 - (2) Shower completely with soap and water.
 - (3) Rinse thoroughly.
 - (4) Rinse shower room walls and floor prior to exit.
 - (5) Proceed from shower to Changing Room and change into street clothes or into new disposable work items.
- B. Remote Shower: The procedures above are to be used if the decontamination facility is used as a remote shower. If a worker cannot gain direct access to the Equipment Room, require that they enter Decontamination Unit and proceed directly through Shower Room to Equipment Room. Decontamination procedure is then completed as required above.
- C. Within Work Area:
- 1. Require that workers NOT eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the Work Area. To eat, chew, drink or smoke, workers shall follow the procedure described above, and then dress in street clothes before entering the non-Work Areas of the building.

END OF SECTION

SECTION 01566 – CLEANUP OPERATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. The Contractor shall provide all material, labor and equipment necessary for cleanup operations. The Contractor shall maintain a neat and clean job site at all times.

1.02 SPECIFICATION MODIFICATIONS

- A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01000 – General Project Requirements or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

- A. Section 00700 – General Conditions.
- B. Section 01000 – General Project Requirements.
- C. Section 01300 – Submittals.

1.04 INFORMATION PROVIDED BY THE CITY

- A. As provided in the Contract Documents.

1.05 SUBMITTALS

- A. The Contractor shall submit as specified in Section 01300 – Submittals, if proposing alternate methods and facilities for concrete washout facilities. See paragraph 3.03.C. 3 in this Section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SITE MAINTENANCE

- A. Cleanup operations shall be conducted in accordance with Section 00700 General Conditions, Article 6 – Contractor’s Responsibilities.
- B. Adequate cleanup shall be a condition for the processing of the Contractor’s monthly progress payment applications.
- C. The Contractor shall, at all times, keep the premises from accumulations of excavated materials, waste materials and other debris resulting from the Work. Site maintenance shall include, but is not limited to, the following:
 - 1. The Contractor shall sweep streets daily to maintain the Site in a neat and clean condition.
 - 2. Provide adequate trash receptacles on the Site and promptly empty when filled.
 - 3. Conduct periodic cleanup of the Site to avoid hazards, interference with traffic or operations at the Site.
 - 4. Keep construction materials such as pipe, forms and scaffolding neatly stacked.
 - 5. Conduct immediate cleanup to protect the Work by removing splattered concrete, asphalt, oil, paint, corrosive liquids and cleaning solutions from all surfaces (linear construction) including walls, floors and metal surfaces (vertical construction) before the surfaces are marred.

6. Volatile wastes shall be properly stored in covered metal containers and removed from the Site daily.
 7. Wastes shall not be buried on the site or disposed of into storm drains, sanitary sewers, streams or waterways. All wastes shall be removed from the site and disposed of in a manner complying with all local permits, ordinances and anti-pollution laws.
 8. Overloading of trucks is prohibited to prevent spillages on all access and haul routes. The Contractor shall provide periodic inspection of traffic areas to enforce the requirements of this Section.
 9. The Contractor shall prevent all excess material from washing into stream beds, storm water facilities, streets, culverts, etc.
- D. All excavated material not incorporated into the Work shall be removed and disposed of by the Contractor so that the site will be left in equal or better condition than its original state.
 - E. Any deficiency in the quantity of material for filling depressions caused by settlement shall be supplied by the Contractor.
 - F. The Contractor shall remove all mobilized equipment, surplus materials, debris and temporary facilities from the site. The construction site shall be left in its original condition or better condition than before the Work commenced.
 - G. In addition, as directed by the City, the Contractor may be required to obtain a City approved release form, signed by the property owners affected by the Work.

3.02 DUST CONTROL

- A. The Contractor shall take all reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by the approved application of an approved chemical suppressant. When practical, dusty materials in piles or in transit shall be covered to prevent blowing.
- B. The Contractor shall make provisions so that buildings or operating facilities that may be adversely affected by dust shall be adequately protected from dust. Existing or new machinery, motors, instrument panels or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.
- C. Contractor shall maintain and keep all streets clean throughout the Work period. The Contractor shall perform street sweeping on a daily basis to remove dust and debris from paved areas within the Work site as well as on all access and haul routes.

3.03 CONCRETE WORK

- A. Three (3) working days after all subsurface work has been completed, the contractor shall initiate the following restoration work: seed and/or sod (depending on contract requirements and/or written agreements with property owners), replacing concrete sidewalks, curbs, gutters, driveways and other surfaces impacted by the Work.
- B. Three (3) working days after the placement of concrete, the Contractor shall conduct cleanup operations related to the completed concrete work as follows:
 1. Removal of forms, backfilling of the form excavation and debris removal from streets, sidewalks and parkway areas shall be accomplished within three (3) working days after the concrete placement. The backfilled areas within one foot of new concrete shall not be compacted until the concrete has cured a minimum of five (5) days.
 2. Five (5) working days after the concrete is placed, the Contractor shall complete all joint caulking, pavement restoration, seeding and sodding. If construction is being performed during periods other than designated seeding and sodding

- seasons, all locations without turf cover shall be completed within ten (10) working days after the beginning of the next seeding and sodding season.
3. If cleanup, backfilling, sodding, joint caulking or pavement restoration is not accomplished within the above limits, all tear-out and installation operations shall cease until these items are finished. Proceeding without these items being completed is at the sole discretion of the City.
 4. All excavated material shall be removed and disposed of by the Contractor so that the grounds will be left in equal or better condition than its original state. Any deficiency in the quantity of material for filling depressions caused by settlement shall be supplied by the Contractor.
 5. Surplus materials, equipment, tools, temporary facilities and structures shall be removed by the Contractor; all debris shall be hauled away by the Contractor and the construction site shall be left in equal or better condition than its original state. Payment of completed items on the Schedule of Values shall be subject to the completion of the cleanup operations.
 6. Tear-out and installation shall not begin if unfavorable conditions for concrete placement are forecast for the next day.
 7. All cleanup operations, as stated above, shall be completed five (5) working days after concrete placement.
- C. Concrete Washout Facilities:
1. The Contractor shall provide facilities for concrete washout to collect and retain all the concrete washout water and solids in leak proof containers.
 2. Lined wash pits or washout boxes are acceptable.
 3. Alternate methods for washout facilities may be considered by the City. The Contractor shall submit for review and approval, per Section 01300 – Submittals, the alternate methods and facilities to be used.
 4. The location of washout facilities shall be indicated on the Construction Site Plan (See Section 01000 – General Project Requirements, paragraph CONSTRUCTION SITE PLAN).
 5. Concrete washout facilities shall be inspected daily and after heavy rains to check for leaks, identify any plastic linings or sidewalls that have been damaged by construction activities and determine whether they have been filled to over 75 percent capacity.
 6. When the washout container is filled to over 75 percent of its capacity, the wash-water shall be vacuumed out or allowed to evaporate to avoid overflows. When the remaining cementitious solids have hardened, they shall be removed from the Site.
 7. Damages to the washout container shall be repaired promptly.
 8. Before heavy rains, the washout container's liquid level shall be lowered or the container shall be covered to avoid an overflow during the rain storm.
 9. Washout facilities shall be removed from the Site upon completion of the Work and the area restored as specified herein.

END OF SECTION

SECTION 01581 – PUBLIC COMMUNICATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section covers communication procedures between the contractor and the public affected by construction activities.
- B. Any time the contractor is acting on behalf of the City to perform work, the communications material between the contractor and the public shall adhere to these technical standards and is subject to review and approval by the City.

1.02 RELATED SECTIONS

- A. Section 00700 – General Conditions:
 - 1. Article 6, paragraph 6.14 – Safety and Protection.
- B. Section 01015 – Specific Project Requirements.
- C. Section 01300 – Submittals.

1.03 DEFINITIONS

- A. Affected Properties – homeowners, businesses, tenants or other entities whose everyday activities could be affected by the work.

1.04 INFORMATION PROVIDED BY THE CITY

- A. The City will provide the contractor with an electronic file for mailing communications to affected property owners for the purpose of Project communications.
- B. The City will provide the contractor with an electronic copy of approved communications templates to be distributed to affected properties.

1.05 SUBMITTALS

- A. Submit as specified in Section 01300 – Submittals.
- B. Notifications – Submit for review and approval all notification materials developed by the Contractor that are to be distributed to affected properties.

1.06 PUBLIC MEETINGS

- A. Description – The contractor shall attend and participate in public meetings held for the project. The contractor’s project manager shall attend and present project details. These details include, but are not limited to, the following:
 - 1. Project schedule.
 - 2. Project phasing.
 - 3. Disruptions to the neighborhood.
 - 4. Work hours.
 - 5. Temporary restoration efforts.
 - 6. Final restoration efforts.
 - 7. Field contact information.
- B. The City will provide a location, date and time of the meeting and will facilitate the meeting.
- C. See Section 01015 – Specific Project Requirements for additional meeting requirements.

1.07 DOOR HANGERS AND OTHER PRINTED COMMUNICATIONS

- A. Description – Door hangers and other printed communications (fact sheets, post cards, signs, etc.) used throughout construction shall be distributed to inform homes and businesses of disruptions.
- B. Templates – The City will provide templates for door hangers and other printed communications in an electronic format. See Figures 1 through 5 for an example door hanger.
- C. Template Modification – The contractor may need to annotate the printed door hangers with project specific information. This effort may include describing the work and adding applicable date and time information for the benefit of the resident.
- D. Review communications material – Review and approval of the communication materials by the City is required prior to the contractor’s distribution of materials.
- E. Printing and Reproduction – The contractor shall print door hangers, mailers and all other communication materials needed for the project.
- F. Distribution List – The list of affected property owners will be provided by the City.
- G. Mailing and Distribution – The contractor shall distribute the door hangers and other printed communications to the affected property owners. Door hangers are to be hand-delivered and not placed in the mailbox. All other printed communications will be delivered in a manner acceptable to the City.
- H. Costs – All costs to develop, reproduce, deliver or mail notifications shall be included in the contractor’s lump sum bid price.

1.08 NOTIFICATION OF UTILITIES

- A. Notify utilities in accordance with Section 00700 – General Conditions, Article 6.

1.09 NOTICES TO PROPERTY OWNERS AND AUTHORITIES

- A. As provided in Section 00700 - General Conditions, Article 6, the Contractor shall notify adjacent property owners and utilities when execution of the work may affect them.
- B. Work Notice:
 - 1. General notice to affected property owners in advance of the work. Notice is required for any work within an easement. Notice shall be given for work within the City’s right-of-way, outside of the street.
 - 2. Type of notification shall be a door hanger.
- C. Denial of Access:
 - 1. Notice for when it is necessary to temporarily deny access to property, driveway, sidewalk or other facility.
 - 2. Type of notification shall be a door hanger.
- D. Smoke Testing:
 - 1. Notice for when the Project involves smoke testing.
 - 2. Type of notification shall be a door hanger.
- E. Utility Service Interruption:
 - 1. Notice for when any utility service connection must be interrupted.
 - 2. Type of notification shall be a door hanger.
- F. Street Closures and Changes to Traffic Patterns:
 - 1. Notices to utilities and other concerned agencies prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.
 - 2. Provide any additional notifications required by the traffic control permit.
 - 3. Type of notification will be written communication prepared and distributed by the Contractor.

- G. Schedule – Notices shall be received by the affected properties no less than two (2) and no more than seven (7) calendar days prior to the work, denial of access, smoke testing, utility service interruption, street closures and changes to traffic patterns or other work that may require notification.

1.10 OTHER COMMUNICATIONS

- A. See Section 01015 – Specific Project Requirements for additional communication requirements not specifically included herein or otherwise required by the Contract Documents.

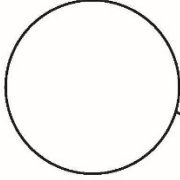
PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

See example templates on pages 4-9.



**PROPERTY ACCESS
TEMPORARILY RESTRICTED**

A KC Water contractor is conducting important infrastructure work at or near your home or business that will require temporary closure of your driveway, sidewalks, or paths.

Date(s) of closure: _____


From _____ **to approximately** _____

QUESTIONS:

Contractor supervisor: _____


Phone or text: _____

We greatly appreciate your patience and cooperation.
Thank you for your support as we continue to improve critical infrastructure in your neighborhood and throughout Kansas City.



KCWATER

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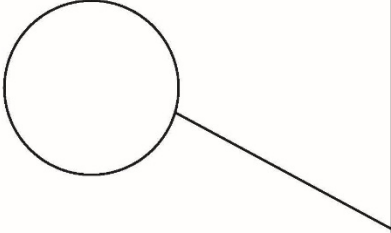


KCW-SC-001 (Rev. 11/19)

EXAMPLE

Obtain Template from City

Figure 1 – Restricted Access Door Hanger



PIPELINE SMOKE TESTING

A KC Water contractor will be testing sewers in your neighborhood that will include a pipeline smoke test.

Date(s) of smoke testing: _____

From _____ **to a proximately** _____

The contractor will blow a non-toxic, non-staining, odorless smoke into sewers in order to identify breaks or defects. The smoke is white to gray in color, creates no fire hazard, and is not harmful to pets or humans.


In the unlikely event smoke enters your structure, you can speed dispersion by opening windows and doors. Also, please notify on-site technicians or their supervisor.

QUESTIONS:

Contact supervisor: _____


Phone or text: _____

We greatly appreciate your patience and cooperation.
Thank you for your support as we continue to improve critical infrastructure in your neighborhood and throughout Kansas City.



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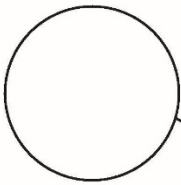


KCW-SC-002 (Rev. 11/19)

EXAMPLE

Obtain Template from City

Figure 2 – Smoke Testing Door Hanger



TRAFFIC TEMPORARILY INTERRUPTED

A KC Water contractor working in your neighborhood must temporarily close streets, particularly streets near your home or business in order to complete important utility improvements to our system.

Duration of traffic interruption: _____

From: _____ **to approximately:** _____


Please follow detour and lane changes, observe barriers and traffic cones, and drive safely and attentively, especially near work crews.

QUESTIONS:

Contractor supervisor: _____


Phone or text: _____

We greatly appreciate your patience and cooperation.
Thank you for your support as we continue to improve critical infrastructure in your neighborhood and throughout Kansas City.



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KCW-SC-003 (Rev. 11/19)

EXAMPLE

Obtain Template from City

Figure 3 -Traffic Interruption Door Hanger

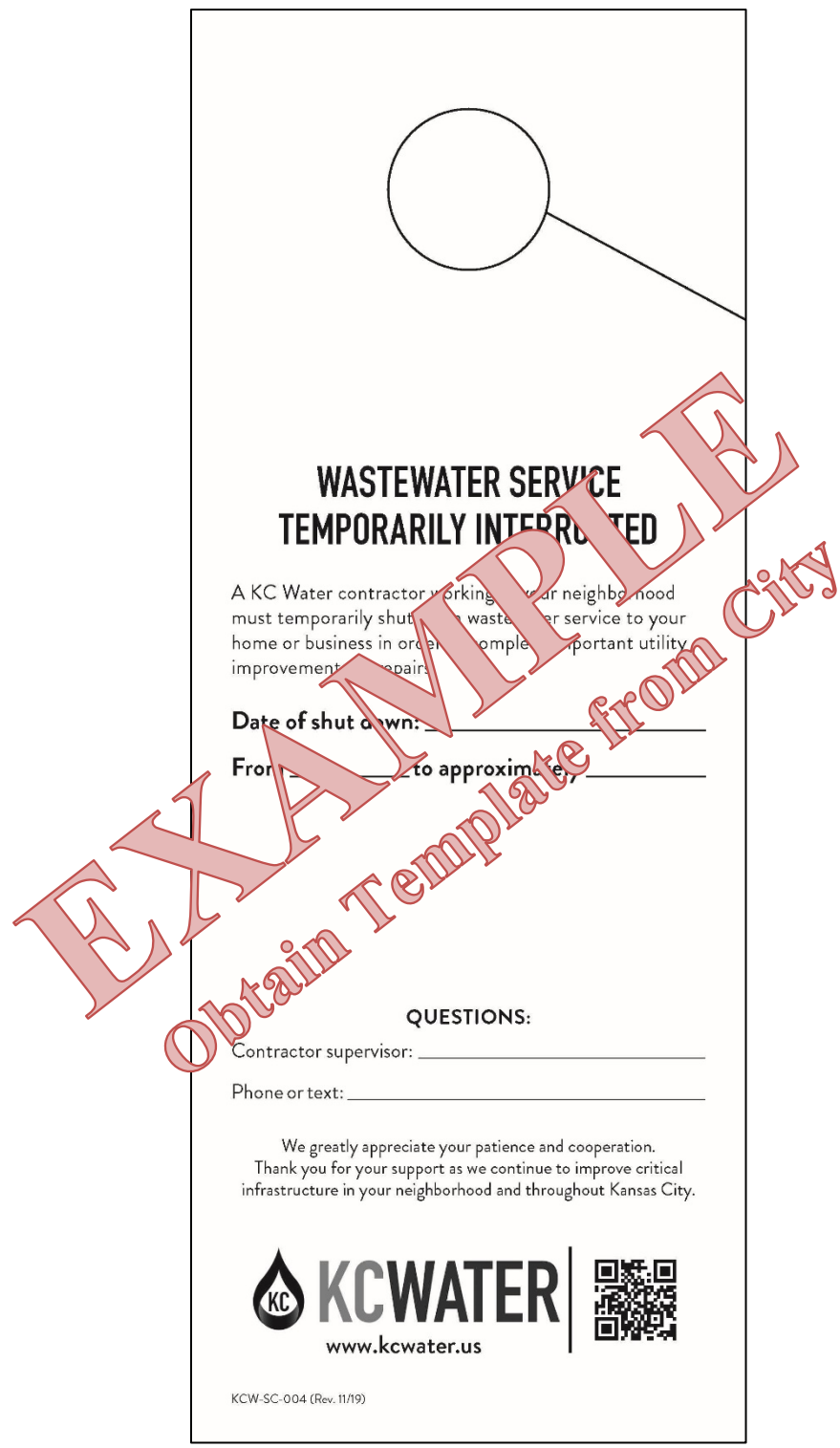


Figure 4 – Wastewater Service Interruption Door Hanger

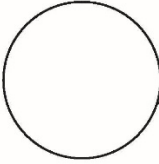


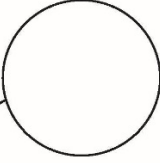


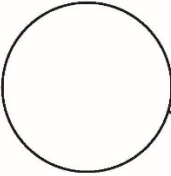
 <h3 style="text-align: center;">WATER SERVICE TEMPORARILY INTERRUPTED</h3> <p>A KC Water contractor working in your neighborhood must temporarily shut down water service to your home or business in order to complete important utility improvements or repairs.</p> <p>Date of shut down: _____</p> <p>From _____ to approximately _____</p> <p>The water main will be flushed and tested after the repair is completed. After water service is resumed, you may experience some cloudy or discolored water. If this occurs, open all taps and let them run for 10 or 15 minutes. Screens, aerators, or other filters should be removed, cleaned and left off while running the water.</p> <p>QUESTIONS:</p> <p>Contractor supervisor: _____</p> <p>Phone or text: _____</p> <p>We greatly appreciate your patience and cooperation. Thank you for your support as we continue to improve critical infrastructure in your neighborhood and throughout Kansas City.</p> <div style="display: flex; justify-content: space-between; align-items: center;">  <div style="text-align: center;"> <h2 style="margin: 0;">KC WATER</h2> <p style="margin: 0;">www.kcwater.us</p> </div>  </div> <p style="font-size: small;">KCW-SC-005 (Rev. 2/20)</p>	 <h3 style="text-align: center;">SERVICIO DE AGUA TEMPORALMENTE INTERRUMPIDO</h3> <p>Un contratista de KC Water trabajando en su vecindario tendrá que interrumpir el servicio de agua en su residencia o negocio temporalmente para completar importantes mejoras o reparaciones.</p> <p>Fecha de interrupción: _____</p> <p>Desde _____ Hasta _____</p> <p>La tubería de agua será drenada y probada después de completar la reparación. Es posible que el servicio de agua restaurado, pueda traer agua descolorada o nublada. Si esto sucede, abra todas las llaves (grifos) y deje correr el agua por 10 o 15 minutos. Cualquier tipo de filtro debe ser removido, limpiado y dejado por fuera mientras el agua corre.</p> <p>PREGUNTAS:</p> <p>Supervisor Contratista: _____</p> <p>Teléfono o texto: _____</p> <p>Apreciamos enormemente su paciencia y cooperación. Gracias por su apoyo mientras continuamos implementando y actualizando infraestructura crucial en su vecindario y a través Kansas City.</p> <div style="display: flex; justify-content: space-between; align-items: center;">  <div style="text-align: center;"> <h2 style="margin: 0;">KC WATER</h2> <p style="margin: 0;">www.kcwater.us</p> </div>  </div> <p style="font-size: small;">KCW SC 005 (Rev. 2/20)</p>
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Figure 5 – Water Service Interruption Door Hanger



**UTILITY WORK
IN YOUR AREA**

A KC Water contractor working in your neighborhood soon will be conducting important infrastructure work as near your home or business.

Date(s) of work: _____

From _____ **to approximately** _____


Construction equipment will be used and may create pits and dusty conditions. Any disruption of lawns, landscaping, driveways, or sidewalks will be restored after this necessary work is completed.

QUESTIONS:

Contractor supervisor: _____


Phone or text: _____

We greatly appreciate your patience and cooperation. Thank you for your support as we continue to improve critical infrastructure in your neighborhood and throughout Kansas City.



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KCW-SC-006 (Rev. 11/19)

Figure 6 – Work Notice Door Hanger

END OF SECTION

Section 01610 - GENERAL EQUIPMENT STIPULATIONS

1. SCOPE. When an equipment specification section in this Contract references this section, the equipment shall conform to the general stipulations set forth in this section, except as otherwise specified in other sections.
2. COORDINATION. Contractor shall coordinate all details of the equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alterations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or Specifications.
3. MANUFACTURER'S EXPERIENCE. Unless specifically named in the Specifications, a manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.
4. WORKMANSHIP AND MATERIALS. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least 1/4 inch thick. When dissimilar metal components are used, consideration shall be given to prevention of galvanic corrosion.

5. STRUCTURAL DESIGN REQUIREMENTS. All equipment, including non-structural components and non-building structures as defined in ASCE 7, and their anchorage, shall be designed and detailed in accordance with the Meteorological and Seismic Design Criteria section.

6. LUBRICATION. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

Lubricants of the types recommended by the equipment manufacturer shall be provided in sufficient quantities to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Lubricants for equipment where the lubricants may come in contact with water before or during a potable water treatment process or with potable water, shall be food grade lubricants. This includes lubricants for equipment not normally in contact with water, but where accidental leakage of the lubricants may contaminate the water.

Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of

waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

7. ELEVATION. The elevation of the site shall be as indicated in the Meteorological and Seismic Design Criteria section. All equipment furnished shall be designed to meet stipulated conditions and to operate satisfactorily at the specified elevation.

8. ELECTRIC MOTORS. Not used.

9. DRIVE UNITS. Not used.

10. SAFETY GUARDS. Not used.

11. ANCHOR BOLTS. Equipment suppliers shall design and detail suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Anchor bolt materials shall comply with the Anchorage in Concrete and Masonry section, and sleeves shall be provided as indicated on the Contract Drawings. Unless otherwise specified, anchor bolts shall be at least 3/4 inch in diameter.

Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

12. EQUIPMENT BASES. Unless otherwise indicated or specified, all electrical equipment shall be installed on concrete bases at least 4-inches high. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components, and adequate grout holes. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout as specified in the Grouting section.

13. SPECIAL TOOLS AND ACCESSORIES. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

14. SHOP PAINTING. All iron and steel surfaces of the equipment shall be protected with suitable protective coatings applied in the shop. Surfaces of the equipment that will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Self-contained or enclosed components shall be shop primed or finished with an epoxy or polyurethane enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of a universal primer.

Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound as recommended by the equipment manufacturer.

15. PREPARATION FOR SHIPMENT. Equipment shall be prepared for shipment as specified in the Product Delivery Requirements section.

16. STORAGE. Handling and storage of equipment shall be as specified in the Product Storage and Handling Requirements section.

17. INSTALLATION AND OPERATION. Installation and operation shall be as specified in respective equipment sections.

18. OBSERVATION OF PERFORMANCE TESTS. Where the Specifications require the presence of Engineer, initial tests shall be observed or witnessed by Engineer. Owner shall be reimbursed by Contractor for all costs of subsequent visits by Engineer to witness or observe incomplete tests, retesting, or subsequent tests.

19. PROGRAMMING SOFTWARE. Not Used.

End of Section

Section 01611 - METEOROLOGICAL AND SEISMIC DESIGN CRITERIA

1. SCOPE. Buildings, non-structural components and non-building structures shall be designed in accordance with this section. In the event of conflict with requirements in other sections, the more stringent criteria shall be followed.

2. DESIGN CRITERIA. Buildings, non-structural components, non-building structures including anchorage of such items, shall be designed in accordance with the following criteria. **Site elevations are provided for the new control room at the Blue River WWTP.**

General Design Data:

Building code and references	IBC 2012, ASCE 7-10 “Minimum Design Loads for Buildings and Other Structures”, AISC 360 “Specification for Structural Steel Buildings”, AISC 341 “Seismic Provisions for Structural Steel Buildings”
Site elevation, above mean sea level (ft)	733.00
Design flood elevation, DFE (ft)	730.00
Design groundwater elevation (ft)	730.00

Wind Design Data:

Ultimate design wind speed, V_{ult} (mph)	120
Nominal design wind speed, V_{asd} (mph)	93
Exposure category	C
Risk Category	III
Building enclosure classification	Partially Enclosed

Snow Design Data:

Ground snow load, P_g (psf)	20
Importance factor (snow loads), I	1.1
Exposure factor (C_e)	1.0
Thermal factor (C_t)	1.1

Ice Design Data:

Nominal ice thickness, t (in)	1
Concurrent wind speed, V_c (mph)	40

Importance factor (ice loads – ice thickness), I_i	1.25
Importance factor (ice loads – concurrent wind), I_w	1.0

Design Data

Mapped MCE short period spectral response acceleration, S_s	0.111 g
Mapped MCE one second period spectral response acceleration, S_1	0.064 g
Design short period spectral response acceleration, S_{DS}	0.119 g
Design one second period spectral response acceleration, S_{D1}	0.103 g
Risk Category	III
Building Importance factor, I	1.25
Building Seismic Design Category	B
Non-Structural Components Importance factors, I_p	1.0

3. WIND ANCHORAGE. Equipment that is to be located outdoors shall have anchor bolts designed for the effects of wind forces, as determined in accordance with ASCE 7, Chapters 26-31. Design of anchorage into concrete shall be in accordance with ACI 318 Appendix D, shall consider concrete to be cracked, and shall not include the strengthening effects of supplementary reinforcement or anchor reinforcement unless approved by Engineer. Design of anchorage into masonry shall be in accordance with ACI 530. Post-installed anchors into concrete or masonry may be used only when approved by Engineer, and shall be designed in accordance with the anchor manufacturer’s research report. Shop drawings shall include full anchor bolt details, and shall be sealed by a professional engineer licensed in the state of the project. Calculations shall be furnished when requested by Engineer.

4. SEISMIC DESIGN.

4-1. General. Structural systems shall provide continuous load paths, with adequate strength and stiffness to transfer all seismic forces from the point of application to the point of final resistance.

4-2. Pre-Engineered Buildings. Pre-engineered buildings shall have sufficient strength and ductility to resist the specified seismic effects defined for buildings and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code.

"W" for buildings shall include the total dead load, the total operating weight of permanent equipment and the effective contents of vessels, and applicable portions of other loads, as required by the specified building code.

4-3. Non-Structural Components. Non-structural components are architectural, mechanical, and electrical items that are permanently attached to and supported by a structure but are not part of the structural system, as indicated in Chapter 13 of ASCE 7. The Non-Structural Components Schedule

identifies the components that require seismic design. The requirements of this paragraph are applicable only to the items listed in the Non-Structural Components Schedule.

4-3.01. General. Design of non-structural components shall be in accordance with all applicable provisions of ASCE 7, Chapter 13. “ W_p ” shall include the total operating weight of the component or system, including, but not limited to, any insulation, fluids, and concentrated loads such as valves, condensate traps, and similar components.

4-3.02. Anchorage Design. Every component in the Non-Structural Components Schedule shall have its anchorage to the supporting structure designed in accordance with ASCE 7, Chapter 13. Design of anchorage into concrete shall be in accordance with ACI 318 Appendix D, shall consider concrete to be cracked, and shall not include the strengthening effects of supplementary reinforcement or anchor reinforcement unless approved by Engineer. Design of anchorage to concrete shall also include the overstrength factors indicated in ASCE 7, Tables 13.5-1 and 13.6-1. Post-installed anchors into concrete or masonry may be used only when approved by Engineer, and shall be designed in accordance with the anchor manufacturer’s research report.

Components shall be attached so that seismic forces are transferred to the structural system. All structural attachments shall be bolted, welded, or otherwise positively fastened. Frictional resistance due to gravity shall not be considered in evaluating the required resistance to seismic forces.

4-4. Non-Building Structures. Not used.

End of Section

Section 01612 - PRODUCT DELIVERY REQUIREMENTS

1. SCOPE. This section covers packaging and shipping of materials and equipment.
2. PREPARATION FOR SHIPMENT. All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept dry at all times.

Painted and coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted and coated surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

Grease and lubricating oil shall be applied to all bearings and similar items.

3. SHIPPING. Before shipping each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

End of Section

Section 01614 - PRODUCT STORAGE AND HANDLING REQUIREMENTS

1. SCOPE. This section covers delivery, storage, and handling of materials and equipment.
2. DELIVERY. Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Contract. These requirements also apply to any subsuppliers making direct shipments to the Site.

Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, placed in operation and found to comply with all the specified requirements.

All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay.

Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

3. STORAGE. Upon delivery, all equipment and materials shall immediately be stored and protected until installed in the Work.

Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored out of doors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

Electrical equipment and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. All space heaters furnished in equipment shall be connected and operated continuously.

Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

In addition to the protection specified for prolonged storage, the packaging of spare units and spare parts shall be for export packing and shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

4. HANDLING. Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

During handling, carbon steel constructed material including chains, straps, and forks on lifting equipment shall not directly contact any equipment or material constructed of stainless steel. It shall be the Contractor's responsibility to correct any carbon steel contamination of stainless steel.

End of Section

Section 01615 - EQUIPMENT IDENTIFICATION

PART 1 – GENERAL

1-1. SCOPE. This section covers the furnishing and installation of nameplates and tags for identification of equipment, valves, panels, and instruments.

1-2. GENERAL. Except as otherwise specified in equipment, valve, and instrumentation sections, nameplates and tags shall be as specified herein. Nameplates or tags shall be provided for all equipment, valves, operator interfaces, control and electrical panels, cabinets, instruments, and instrument racks that have been named and/or tagged on the Drawings.

1-3. SUBMITTALS. Drawings and data shall be submitted in accordance with the requirements of the Submittals Procedures section for each type of tag provided including materials, colors, sizes, letter sizes, and installation instructions.

PART 2 - PRODUCTS

2-1. EQUIPMENT NUMBER PLATES. All equipment tagged on the drawings, except for submerged equipment shall be provided with number plates bearing the equipment tag number identified on the Drawings. Number plates shall be bevelled, 1/8th inch thick laminated black phenolic plastic engraving stock with white core. Lettering on number plates shall be capitalized block letters 3/4 inch high. Number plate height shall be twice the letter height. Number plate length shall be as needed, with suitable margins all around. Lettering shall be placed in one row where practicable; however, where necessary due to excessive length, lettering shall be placed on more than one row and centered.

Number plates shall be attached with stainless steel panhead screws, rivets, or drive screws.

When a number plate cannot be installed due to the physical size, space, or mounting surface geometry of the equipment, the Contractor shall provide a 12 gauge stainless steel tag with engraved or imprinted equipment tag number. Lettering on tags shall be 1/4 inch high. Tags shall be rectangular with smooth edges and shall be fastened to the equipment with stainless steel mechanical fasteners or with a stainless steel chain.

2-2. EQUIPMENT INFORMATION PLATES. Equipment shall be provided with engraved or stamped equipment information plates securely affixed with mechanical fasteners to the equipment in an accessible and visible location. Equipment information plates shall be in addition to the number plates specified. Equipment information plates shall indicate the manufacturer's name, address, product name, catalog number, serial number, capacity, operating and power characteristics, labels of tested compliances, and any other pertinent design data. Equipment information plates listing the distributing agent only will not be acceptable.

2-3. VALVE AND GATE TAGS. Not used.

2-4. PANEL NAMEPLATES. Nameplates shall be provided on the face of each panel and cabinet. Panel identification nameplates shall be mounted at the top of the panel shall include the panel descriptive name and tag number as indicated on the Drawings, in two or three lines of text. Lettering shall be 3/4 inch high.

Nameplates for devices mounted on or in the panel shall be inscribed with the text as indicated on the Drawings. Where nameplate information is not indicated on the Drawings, inscriptions shall be in accordance with information in the supplier's submittal drawings as guided by information in the relevant specification section. Panel device nameplates shall have engraved letters 3/16 inch high.

Nameplate material and size shall be as specified above for equipment number plates. Nameplates shall be secured to the panel with stainless steel panhead screws.

2-5. INSTRUMENT TAGS.

2-5.01. Temporary Tags. Where instruments are not provided with permanent tags furnished from the factory, instruments shall be tagged or marked in the factory with the instrument tag number indicated on the Drawings.

2-5.02. Permanent Tags. Instruments shall be tagged with the instrument tag number indicated on the Drawings. Tags shall be 12 gauge stainless steel with engraved or imprinted symbols. Lettering on tags shall be 1/4 inch high. Tags shall be rectangular with smooth edges and shall be fastened to the instrument with stainless steel mechanical fasteners or with a stainless steel chain.

PART 3 – EXECUTION. Not used.

End of Section

Section 01620 - EQUIPMENT SCHEDULE

1. SCOPE. This section consists of an equipment schedule for items for which a basic level of manufacturer's field services or operation and maintenance manuals are required, but not covered in other sections. When other sections indicate that manufacturer's field services and operation and maintenance manuals are required, the requirements shall be as specified in the other sections.

Specific requirements for manufacturer's field services are covered in the Quality Control section and the equipment specifications.

Specific requirements for operation and maintenance manuals are covered in the Submittals Procedures section and the equipment specifications.

2. SCHEDULE. Manufacturer's field services, including equipment installation checks and training, and operation and maintenance manuals shall be provided for the items of equipment indicated in the following schedule:

Spec Section	Type of Equipment	Mfr's. Field Services	O&M Manual
13500	Instrumentation and Control System	X	X
13510	Computer System Hardware		X
13520	Computer System Software	X	X
13530	Programmable Logic Controllers	X	X
13540	Radio Equipment		X
13561	Panel Mounted Instruments		X
13566	Miscellaneous Instruments		X
13570	Panels and Appurtenances		X
13590	Process Control Network Systems	X	X
13591	Metallic and Fiber Optic Communication Cable and Connectors	X	X
15500	Heating, Ventilating, and Air Conditioning	X	X
15650	Refrigeration Systems	X	X
16050	Electrical	X	X

End of Section



SUBSTITUTION REQUEST

Project Number: 81000819/1712 _____

Project Title: Wastewater SCADA System Improvements Phase 2 _____

To: _____

Authorization Number: _____

Re: _____

From: _____

Date: _____

Contract For: _____

Specification Title: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone No. _____

Trade Name: _____ Model No. _____

Installer: _____ Address: _____ Phone No. _____

History: New Product 2-5 years old 5-10 years old More than 10 years old

Differences between proposed substitution and specified product: _____

Point-by-point comparative data attached – REQUIRED

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance, service, and availability of replacement parts, as applicable, are available.
- Proposed substitution will not affect or delay Progress Schedule, except as stated below.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances, except as stated below.
- Payment will be made for changes to building design, including architectural or engineering design, detailing, licenses, royalties, and construction costs caused by the requested substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be completed in all respects.

Reason for not providing specified item: _____

Similar Installation:

Project: _____

Design Professional: _____

Address: _____

Owner: _____

Date Installed: _____

Proposed substitution affects other parts of Work: No Yes; explain _____

Savings to Owner for accepting substitution: _____

Proposed substitution changes Contract Time: No Yes; add/deduct _____ days.

Supporting Data Attached:

Product Data Drawings Tests Reports Samples _____

Attachments: _____

Submitted by: _____

Signature: _____

Firm: _____

Address: _____

Telephone: _____ Fax: _____ E-Mail: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer DP _____

DESIGN PROFESSIONAL'S REVIEW AND ACTION

- Substitution approved – Make submittals in accordance with Specification Section 01300.
- Substitution approved as noted – Make submittals in accordance with Specification Section 01300.
- Substitution rejected – Use specified materials.
- Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

-
- Distribution:
- Owner
 - Design Professional
 - Contractor
 - Consultant
 - Construction Manager
 - Other

SECTION 01700 – TRAFFIC CONTROL

PART 1 – GENERAL

1.01 SUMMARY

- A. The Contractor shall provide all materials, labor, and equipment (including permits, barricades, cones, drums, construction warning signs, flagmen incidental devices) to protect, warn and guide: vehicular traffic, pedestrian traffic and to protect their personnel and equipment on the site. This specification applies to work being done in conjunction with capital projects and not emergencies or other maintenance-related activities.

1.02 SPECIFICATION MODIFICATIONS

- A. It is understood that throughout this section these specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements, or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Section 01700.A – Traffic Control Formula.xls
 - 2. Section 01700.B – Street Guide.pdf

1.04 CODES AND STANDARDS

- A. The publications listed below form a part of this specification to the extent referenced. The publications referred to within the specification are by the basic designation only.
- B. American Traffic Safety Services Association (ATSSA)
- C. “City of Kansas City, Missouri Public Works Department Construction and Material Specifications” (<http://kcmo.gov/>) (KCMO PW 2305 – Traffic Control – Pedestrian Traffic Control and Sidewalk Closure.)
- D. Manual on Uniform Traffic Control Devices (MUTCD).
- E. MODOT traffic control and regulations and permits.

1.05 DEFINITIONS

- A. City Block – A segment of a street or roadway between two intersections.
- B. Working Hours – The Contractor must conduct construction operations in compliance with the City of Kansas City, Missouri Code of Ordinances, Chapter 46 – NOISE CONTROL which generally defines normal working hours as 7:00 am to 6:00 pm on weekdays. Working hours also include any time period approved in writing by the City (see Section 01000 – General Project Requirements, paragraph TEMPORARY ENVIRONMENTAL PROTECTION).
- C. Non-Working Hours – Any period of time not defined as Working Hours.
- D. Public Works Department – The City of Kansas City, Missouri – Public Works Department.
- E. Traffic Control Supervisor – The qualified employee of the Contractor designated to have overall responsibility of the implementation of the Traffic Control Plan, conformance to the Traffic Control Permit and maintenance of traffic control devices.
- F. Work Zone – An area of active construction activity along a single street that causes temporary disruption to pedestrian traffic, vehicular traffic, access to properties, or on-street parking.

- G. Extended Work Zone – Any work that encompasses more than one city block or street.

1.06 SUBMITTALS

- A. Submit as specified in Section 01300 – Submittals.
- B. Shop Drawings:
 - 1. Not applicable.
- C. Product Data:
 - 1. Not applicable.
- D. Samples:
 - 1. Not applicable.
- E. Other Submittals:
 - 1. Traffic Control Plans(s):
 - a. Submit plan(s) directly to the Public Works Department for review and approval as required for permitting. Approval of the traffic control plan is required prior to submitting permit applications.
 - b. Submit the final, approved plan(s) in accordance with Section 01300 – Submittals for informational purposes only.
 - c. Submit changes or revisions to the plan(s) as required by the City’s Traffic Control Permit.
 - d. Submit changes or revisions to the Traffic Control Plan necessary for construction phasing.
 - 2. Traffic Control Permit – submit a copy of the traffic control permit upon approval from the Public Works Department.
 - 3. Traffic Control Supervisor:
 - a. Submit name, qualifications, and contact information in accordance with Section 01300 – Submittals.
 - b. Submit name, qualifications, and contact information directly to the Public Works Department.
 - 4. Public Works Department standard specifications.
 - 5. Public Works Department standard details.
 - 6. Maintenance records of traffic control devices.

1.07 GENERAL

- A. When the requirements of this section conflict with the requirements of the approved Traffic Control Permit, then the requirements of the Traffic Control Permit shall govern. In all instances, the Contractor shall comply with all KCMO ordinances.
- B. The Contractor shall maintain access for pedestrians, vehicles and all properties served by the streets and sidewalks within the site.
- C. All work shall be coordinated through the City of Kansas City, Missouri – Public Works Department.
- D. Coordination of the traffic control permit shall be conducted during normal business hours (8:00 am through 5:00 pm).

1.08 SPECIFIC PROJECT REQUIREMENTS

- A. Specific traffic control requirements are provided in Section 01015 – Specific Project Requirements.

1.09 RESPONSIBILITY

- A. The Contractor shall designate a Traffic Control Supervisor having the responsibilities defined in paragraph DEFINITIONS.

- B. The Traffic Control Supervisor's name, contact information and qualifications shall be submitted to the City prior to the preconstruction conference.
- C. The Traffic Control Supervisor's name and contact information shall be submitted to the Public Works Department as required by the Traffic Control Permit. The contact information provided shall allow the City (Public Works Department) to contact the Traffic Control Supervisor during both working and non-working hours. This information shall be submitted with the application for the Traffic Control Permit and in accordance with paragraph SUBMITTALS.

1.10 SUBMITTAL OF STANDARD DETAILS AND SPECIFICATIONS

- A. The Contractor shall obtain a copy of all Public Works Department's standard specifications and details to be used as part of the project. Copies shall be submitted in accordance with paragraph SUBMITTALS.

1.11 ACCESS REQUIREMENTS

- A. Unless otherwise stated in Section 01015 – Specific Project Requirements, the Contractor shall maintain access for pedestrians and vehicles to all properties served by streets and sidewalks affected by the Work.
- B. Special Restrictions for Extended Work Zones:
 1. A maximum of two (2) consecutive city blocks shall be under construction at any one time.
 2. Where construction activities cause disruption (i.e. sidewalk closures and/or temporary restriction of on-street parking) to two (2) consecutive city blocks the following restrictions shall apply:
 - a. At a minimum, pedestrian access shall be maintained on one side of the street only if work can be completed in less than fifteen (15) days. Sidewalk closures shall be limited and temporary facilities shall be provided as necessary to allow pedestrian access to all occupied properties affected by construction activities.
 - b. If more than one (1) city block is affected by construction, then construction activities shall be conducted so that on-street parking is maintained on at least one side of the street, on one of the city blocks affected. That is, if on-street parking is eliminated within a city block, the adjacent city block (along the same street) must provide at least on-street parking on one side.
 - c. If a sidewalk will need to be closed more than 15 days, advance approval of the Bike Pedestrian Advisory Committee is required. If a sidewalk closure is planned for more than 15 days in the Greater Downtown Area Plan region, advance approval is required from the Parking and Transportation Commission.
- C. Access to adjacent properties served by the street(s) within the project shall be maintained at all times.
- D. Traffic shall move through the construction site in accordance with the Traffic Control Permit.
- E. When required, flaggers shall coordinate the movement of traffic through the construction site.
- F. Temporary Restoration of Access during Non-Working Hours:
 1. All roadways shall be re-opened to traffic in accordance with the Traffic Control Permit or to normal operating conditions (whichever applies) at the end of each work day.
 2. No construction related equipment or material shall be on the roadway outside of normal working hours unless approved by the City (see Section 01000 – General Project Requirements, paragraph CONSTRUCTION SITE PLAN).

1.12 TRAFFIC CONTROL PLAN(S)

- A. Unless otherwise indicated on the Drawings or in Section 01015 – Specific Project Conditions, the Contractor shall be responsible for the development and implementation of the Traffic Control Plan necessary to obtain a Traffic Control Permit(s).
- B. All costs associated with development, revision or finalization of Traffic Control Plan(s) shall be included in the Contractor’s Bid.
- C. General Traffic Control requirements shall include but are not limited to the following:
 - 1. MUTCD requirements shall be maintained on all traffic control plan submittals.
 - 2. Plans shall clearly identify all traffic control devices to be placed including the location, spacing and other pertinent data required for the traffic control plan reviews.
 - 3. Plan reviews and resubmittal reviews should be scheduled to be completed with at least two (2) weeks for City staff review on standard traffic control plan submittals. This time may be extended if the plan is complex or of a large volume.
 - 4. All street typologies listed on the Major Street Plan (<https://www.kcmo.gov/city-hall/departments/city-planning-development/other-city-plans>) will be required to maintain a minimum of one twelve foot (12’) lane in each direction for traffic at all times.
 - 5. Limited closures on street typologies listed on the Major Street Plan may be allowed but will likely be limited to weeknights and/or weekend work depending on the location of the proposed closure. Full closures may not be possible in some areas of the City.
 - 6. Electronic Message Boards will be required as part of the communication plan for all lane closures or restrictions on street typologies listed on the Major Street Plan. These signs will need to be in place at least one (1) week prior to the lane closure or restriction and will need to be maintained throughout the closure duration.
 - 7. Closures in and adjacent to the Streetcar Corridor will be required to have a Track Access Permit.
 - 8. Residential street traffic control plans will be developed in a way to allow safe travel and maintain access to all properties adjacent to and in the area of the traffic control area.
 - 9. The Contractor is required to maintain the road surface condition on the haul route to the condition that existed at the time of permit issuance. All damage to the pavement on the haul route caused by the contractor shall be repaired by the Contractor at no additional cost to the City.
- D. The following resources are provided for use by the Contractor to estimate the costs associated with the traffic control permits obtained for this contract. These resources are for estimating purposes only and the actual permit costs will be calculated by the Public Works Department at the time of the permit application. The Contractor is responsible for all costs associated with the traffic control for this contract, including permit fees.
 - 1. Section 01700.A - Traffic Control Formula.xls
 - 2. Section 01700.B - Street Guide.pdf
 - 3. https://library.municode.com/mo/kansas_city/codes/code_of_ordinances?nodeId=COORKAMIVOII_CH70TRVE_ARTIIADEN_DIV1GE_S70-39AUDICLSTSIOTTRAUESEMPARE

1.13 TRAFFIC CONTROL PERMIT(S)

- A. The Contractor shall not submit Traffic Control Permit applications until the traffic control plan has been approved by the Public Works Department.
- B. The Contractor shall obtain a Traffic Control Permit before any construction activity occurs on any City street. Permits shall be obtained and submitted in accordance with

Section 01300 – Submittals shall be made no less than two (2) weeks in advance of the construction activity.

- C. Specific requirements and the application for Traffic Control Permit can be downloaded from the City’s website at <http://kcmo.gov/>
- D. The associated permit fees, which may be time and street-type-dependent, are to be obtained from the Public Works Department.
- E. All residential, arterial and collector streets require a separate permit and are subject to peak hour restrictions.
- F. All costs associated with the Traffic Control Permit(s) shall be included in the Contractor’s Bid.

1.14 NOTIFICATIONS

- A. Advance notification of affected property owners shall be done in accordance with Section 01581 – Public Communications.
- B. Electronic Message Boards are required at least one (1) week in advance of any arterial street closure(s).

PART 2 – PRODUCTS

2.01 TRAFFIC CONTROL DEVICES

- A. All traffic control devices shall conform to Part 6 of the “Manual on Uniform Traffic Control Devices” (MUTCD)
- B. No substitutions for the devices required by MUTCD or changes in the methods of traffic control as outlined herein will be allowed without written approval of the Director of Public Works or their designee.

PART 3 – EXECUTION (NOT USED)

3.01 SAFETY PRECAUTIONS

- A. Contractor shall take any and all precautions to guard against injury to persons or damage to property until final acceptance of the work by the City or their representative.
- B. Precautions shall include, but no limited to, protection of vehicular and pedestrian traffic from injury or damage due to open excavations, operation of construction equipment, materials storage, etc. by the proper placement of appropriate safety devices.
- C. The Contractor shall maintain the safety devices and maintain their proper placement throughout the required period.
- D. Construction practices shall be followed that will eliminate all safety hazards.
- E. The roadway shall be kept clean and free of construction related debris at all time.

3.02 DEVICE INSTALLATION AND MAINTENANCE

- A. Traffic control devices shall be installed and maintained in accordance with KCMO Specification 2305 with the exception that the paragraphs for Method of Measurement and Basis for Payment do not apply.
- B. The Contractor shall maintain records of any maintenance required and the date on which it was completed. These records shall be maintained for the duration of the project and submitted in accordance with paragraph SUBMITTALS on a monthly basis.
- C. The contractor’s designated Traffic Control Supervisor shall make regular workday inspections of the traffic control devices installed as part of Work.
- D. It shall be the Contractor’s responsibility to maintain all traffic control devices in proper working condition and placement at all times.

- E. The Contractor shall immediately correct any deficiencies in traffic control.
- F. Any traffic control device not in use shall be covered, removed, or turned away from the view of oncoming traffic.

3.03 CHANGES TO THE TRAFFIC CONTROL PLAN

- A. Whenever the work area changes, all construction warning signs and traffic channelization devices shall be made current.
- B. The Public Works Department reserves the right to adjust or revise the traffic handling requirements as necessary after construction on the project has started. These changes will be determined based on periodic inspections throughout the duration of the project by both the Water Services and Public Works inspection staff.
- C. Notice of such change will be transmitted to the Contractor and it shall be the Contractor's responsibility to make the necessary changes as soon as practicable, but no more than one (1) calendar day, after receipt of the notification. Immediate changes to the traffic control shall be required in situations that are deemed as a public safety matter by the City representatives.
- D. If the Contractor encounters conditions that would require a change in method of traffic control, the Contractor shall immediately notify the City's representative. At least 48 hours before the start of the proposed change, the City's representative will request approval of the change in method of maintaining traffic from the Public Works Department. The Contractor shall not proceed with the change without the approval of the Public Works Department.

3.04 PEDESTRIAN TRAFFIC CONTROL

- A. Pedestrian traffic control shall conform to KCMO Specification 2305, paragraph-Pedestrian Traffic Control.

3.05 VEHICLE PARKING

- A. Parking of construction vehicles, equipment, vehicles of contractor's personnel shall not interfere with public traffic, parking, access by emergency vehicles, or City operations.

3.06 HAUL ROUTES

- A. The Contractor shall consult with the City (Water Services Department and Public Works Department) to establish public thoroughfares to be used for haul routes and site access.
- B. Residential streets shall not be used as part of the proposed haul routes.

3.07 EMERGENCY CONDITIONS

- A. Damage to existing utilities during construction of the Project which requires immediate repair may be considered as an emergency and as such may not be subject to all the restrictions contained herein. These shall be reported to Water Services and Public Works immediately. All subsequent emergency traffic control measures or adjustments shall be coordinated with the City representatives.
- B. The Contractor shall immediately contact the utility company whose facilities are involved that may require immediate repair.
- C. Such repair work, once declared an emergency by the utility company, shall be pursued on a continuous (24 hours per day) basis until complete or advanced to such a point that use of the roadway can be returned to normal operation and any subsequent repairs can be completed during regular working hours.
- D. The City reserves the right to determine which utility work will be considered an emergency. Any costs incurred by the Contractor for such emergency utility repair,

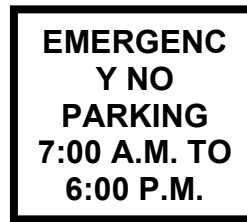
including the cost of any additional traffic control that may be required, shall be the Contractor's sole responsibility.

3.08 EMERGENCY NO PARKING SIGNS

- A. When it is necessary to eliminate parking on a part of a street to facilitate construction work, the Contractor shall, subject to the approval of the Public Works Department, post "Emergency No Parking" signs.
- B. Signs shall be fabricated with the following dimensions, text sizes and include the following text:



or



Placard

Height: 24 inches

Placard Width: 18 inches

Placard Color: Silver (reflective)

Lettering Height: 3 inches

Line Spacing: 1.1 inches

Lettering Color: Red

Border Thickness: 0.625 inches

Border Margin from Edge of Placard: 0.375 inches

Border Color: Red

- C. The signs shall be made of aluminum, plastic or plywood panels. Paper or cardboard signs are not allowed.
- D. The signs shall be installed on either steel drive posts or existing utility poles at a height of five (5) feet to the bottom of the sign.
- E. Signs shall be placed on the side of the street where parking is to be eliminated.
- F. The signs are to be installed at the beginning and end of each block and at a maximum of 150-foot intervals in between.
- G. These signs must be installed a minimum of 18 hours and a maximum of 48 hours in advance of the time the Contractor plans to begin work.
- H. The Contractor shall contact the City's representative as soon as the signs are installed. The City's representative will then contact the Public Works Department as the signs are installed, so that a temporary regulation can be written by the Public Works Department and so that the Kansas City, Missouri, Police Department can be notified. The signs cannot be enforced without this notification from the City. The notification to the City must be made by 12 noon for enforcement to be effective the following day.
- I. If there are existing parking signs with a lesser degree of restriction, the Contractor shall install the Emergency No Parking signs as outlined above and shall cover the existing signs with the Emergency No Parking sign or some type of semi-permanent cover (paper and tape will not be accepted).
- J. The Contractor shall immediately remove the Emergency No Parking signs and all semi-permanent sign covers as soon as work on the block has been completed.

- K. If it becomes apparent for any reason that work will cease for more than 72 hours, the same signs and covers shall be removed and must be reinstalled subject to the minimum eighteen (18) hours advance-notice before work can proceed.
- L. If work does not begin within 48 hours after the signs are posted, the same procedure must be followed. Failure by the Contractor to abide by all the provisions concerning “Emergency No Parking” signs, shall result in the cancellation of the permit.
- M. The Contractor shall maintain a minimum of one (1) lane of traffic each direction at all times unless otherwise allowed by permit.
- N. The Contractor shall keep residents, schools, businesses, churches and other public entities informed of the work schedule that would interfere with access to their facility. Notification shall be distributed at least three (3) weeks in advance of work occurring near a facility.
- O. The Contractor shall coordinate with KCATA, as necessary, on proposed lane closures impacting bus travel routes.

END OF SECTION

Section 01700.A - TRAFFIC CONTROL FORMULA

CLASSIFICATION	EXPECTED ADT			ADT TO BE USED		FACTOR FOR DIRECTIONAL OF TRAVEL	TWO WAY STREET	ONE WAY STREET
Expressways	at least 15,000 veh./day			15,000 veh./day				
Primary Arterials	at least 10,000 veh./day			10,000 veh./day				
Secondary Arterials	5,000 to 10,000 veh./day			5,000 veh./day		=	0.58	1.17
Other Streets	less than 5,000 veh./day			500 veh./day				

Total number of driving lanes for the direction of travel.	1	2	3	4	5
1 lane	1.17				
2 lanes	0.58	1.17			
3 lanes	0.39	0.78	1.17		
4 lanes	0.29	0.58	0.87	1.17	
5 lanes	0.23	0.46	0.69	0.92	1.17

A.)	[1]	[2]	[3]	[4]	1 WAY/ 2 WAY	NUMBER OF LANES	[7]	TOTAL COST	
	ADT	NUMBER OF DAYS	DETOUR DISTANCE IN LINEAR MILES	UNIT COST	[5] SPECIFIC FACTOR DIRECTION OF TRAVEL	[6] SPECIFIC FACTOR FOR DRIVING LANES	REDUCE CALCULATION		
	0	0	0.0000	0.17	0	0	0	0.00	(SS0068)

B.)	NUMBER OF SIDES	UNITS	TRAFFIC CONTROL PERMIT FEE	NUMBER OF DAYS	TOTAL COST
Parking Lanes:	1	0.00	0.63	0	0.00 (SS0070)

C.)	NUMBER OF SIDES	UNITS	COST FOR SIDEWALKS	NUMBER OF DAYS	REDUCED CALCULATION ADJACENT LANE	TOTAL COST
Sidewalks:	1	0.00	0.67	0	0	0.00 (SS0069)

D.)	PARKING LANES LENGTH	R/W SECTION	TOTAL UNITS	(SS0070)	E.)	SIDEWALK LENGTH	R/W SECTION	TOTAL UNITS	(SS0069)
	0	20	0.00	(SS0070)		0	20	0.00	(SS0069)

F.)	METER DAYS	NUMBER METERS	COST/ METER	TOTAL COST	(SS0003)	(SS0071)	G.)	NUMBER OF ALLEYS	NUMBER OF DAYS	COST/ALLEY PER DAY	TOTAL COST
	0	0	3.47	0.00	(SS0003)	(SS0071)		0	0	1.74	0.00

H.)	DETOUR DISTANCE IN LINEAR FEET	FEET/MILE LINEAR	DETOUR DISTANCE IN LINEAR MILES	(SS0068)
	0	5280	0.0000	(SS0068)

I.)	APPLICATION FEE APPLIES	ADT TOTAL	PARKING TOTAL	SIDEWALK TOTAL	METER TOTAL	ALLEY TOTAL	GRAND TOTAL
	\$88.00 (SS0067)	0.00 (SS0068)	0.00 (SS0070)	0.00 (SS0069)	\$0.00 (SS0003)	\$0.00 (SS0071)	\$88.00

FREEWAYS

**SOUTH
OF THE RIVER**

<u>STREET</u>	<u>FROM</u>	<u>TO</u>
Bruce R. Watkins Dr.	75th St.	Bannister Rd.
I-35	Missouri River	State Line
I-70	State Line	East City Limits
I-435 (East)	Missouri River	U.S. 71
I-435 (South)	State Line	U.S. 71
I-470	U.S. 71	I-70
I-670 (Crosstown Frwy.)	State Line	I-70
M-350	I-435 (East)	East City Limits
U.S. 71	Bannister Rd.	South City Limits
West Frwy.	I-70	I-670

EXPRESSWAYS

**SOUTH
OF THE RIVER**

Blue Pkwy.	Swope Pkwy.	I-435
Bruce R. Watkins Dr.	51st St.	75th St.
Chouteau Trfwy.	Missouri River	Truman Rd.
Front St.	River Front Rd.	East City Limits

EXPRESSWAYS (continued)**SOUTH OF THE
RIVER (continued)**

STREET	FROM	TO
M-150 (Outer Belt Rd.)	State Line	East City Limits
Riverfront Rd.	I-35	Front St.
Shawnee Mission Pkwy.	State Line	Ward Pkwy.
Southwest Blvd.	Southwest Trfwy.	State Line
Southwest Trfwy.	I-35	43rd St.
Swope Pkwy.	The Paseo	Meyer Blvd.
21st Century Pkwy.	State Line	M-150
Ward Pkwy.	Brookside Blvd.	Shawnee Mission Pkwy.

PRIMARY ARTERIALS**SOUTH
OF THE RIVER**

23rd St.	State Line	Hardesty
23rd St. Blvd.	Hardesty	Big Blue River
23rd St.	Big Blue River	East City Limits
31st St.	I-70	Southwest Blvd.
51st-47th St.	Blue Pkwy.	I-470
63rd St./ 63rd St. Trfwy.	Ward Pkwy.	East City Limits
Hickman Mills Dr.	The Paseo	85th St.
85th St.	State Line	Hickman Mills Dr.

PRIMARY ARTERIALS (continued)**SOUTH OF THE
RIVER (continued)**

STREET	FROM	TO
87th St.	Bruce R. Watkins Dr.	Military Club Rd.
109th St.	Raytown Rd.	East Longview Pkwy.
Bannister Rd.	State Line	M-350
Blue Ridge Blvd.	State Line	129th St.
Blue Ridge Blvd.	Winner Rd.	9th St.
Blue Ridge Cut-Off	U.S. 40	Raytown City Limits
Blue River Rd.	Bruce R. Watkins Dr.	Blue Ridge Blvd. Ext.
Broadway - J.C. Nichols Pkwy.	I-70	Ward Pkwy.
Brookside Blvd.	Ward Pkwy.	Meyer Blvd.
Brush Creek Blvd.	Elmwood	Bruce R. Watkins Dr.
Cherry St.	Holmes Rd.	Heart of America Bridge
Chestnut Trfwy.	Independence Ave.	Riverfront Rd.
County Line Rd. (155th St.)	Grandview City Limits	East City Limits
East Longview Pkwy.	109th St.	Noland Rd.
Gregory Blvd.	Bruce R. Watkins Dr.	Noland Rd.
Gregory Blvd. Ext.	Noland Rd.	East City Limits

SECTION 01700.B - Street Guide

PRIMARY ARTERIALS (continued)

SOUTH OF THE RIVER (continued)

<u>STREET</u>	<u>FROM</u>	<u>TO</u>
Hardesty Ave.	Independence Ave.	31st St.
High Grove Rd.	U.S. 71	East City Limits
Holmes Rd.	Bannister Rd.	Cass County Line
Independence Ave.	Holmes	Highland Ave.
Independence Blvd.	Highland Ave.	Benton Blvd.
Independence Ave.	Benton Blvd.	Winchester Ave.
Main St.	I-70	Ward Pkwy.
Manchester Trfwy.	Truman Rd.	63rd St. Trfwy.
Martha Truman Rd.	State Line	U.S. 71
Meyer Blvd.	63rd St. at The Paseo	Swope Pkwy.
Military Club Rd.	87th St.	East Longview Pkwy.
Noland Rd.	I-70	Bannister Rd.
The Paseo	I-35	79th St.
Raytown Rd.	Stadium Dr.	I-470
Raytown Rd.	High Grove Rd.	M-150
Relocated Raytown Rd.	I-470	County Line Rd.
Red Bridge Rd.	State Line	U.S. 71
Riverfront Rd.	Front St.	Chouteau Trfwy.
Stadium Dr.	31st St.	I-435

PRIMARY ARTERIALS (continued)**SOUTH OF THE RIVER (continued)**

STREET	FROM	TO
Stadium Dr. (Dutton Brookfield Dr.)	I-435	U.S. 40 Highway
State Line Rd.	75th St.	M-150
Truman Rd. (15th St.)	Oak St.	East City Limits
U.S. 24	Winchester Ave.	Winner Rd.
U.S. 40	31st St.	East City Limits
Van Brunt Blvd.	27th St.	Elmwood
Volker Blvd.	Brookside Blvd.	The Paseo
Ward Pkwy.	Shawnee Mission Pkwy.	Wornall Rd.
West Longview Pkwy.	87th St.	Raytown Rd.
Winner Rd.	U.S. 24	East City Limits
Wornall Rd.	Ward Pkwy.	Bannister Rd.

SECONDARY ARTERIALS**SOUTH OF THE RIVER**

9th St.	Broadway	Winner Rd.
9th St.	State Line	I-35
10th St.	Broadway	Woodland Ave.
11th St.	Broadway	Woodland Ave.

SECTION 01700.B - Street Guide

SECONDARY ARTERIALS (continued)**SOUTH OF THE
RIVER (continued)**

STREET	FROM	TO
12th St.	State Line	Winchester Ave.
13th St.	I-70 Ramps at Charlotte	I-29
14th St.	Holmes	I-29
18th St.	Broadway Blvd.	Hardesty Ave.
27th St.	Main St.	Van Brunt Blvd.
33rd St.	Southwest Trfwy.	Broadway
35th St.	The Paseo	Cleveland
39th St.	State Line	Van Brunt Blvd.
43rd St.	State Line	Main St.
47th St.	Roanoke Pkwy.	The Paseo
55th St.	Ward Pkwy.	Cleveland Ave.
63rd St.	State Line	Ward Pkwy.
75th St.	State Line	Bruce R. Watkins Dr.
79th St.	Oldham Rd.	Raytown Rd.
79th St.	State Line	Wornall Rd.
91st St.	Hillcrest Rd.	Blue River Rd.
107th St.	Blue Ridge Blvd.	Raytown Rd.
135th St.	State Line	Holmes Rd.
139th St.	Holmes Rd.	U.S. 71
155th St.	U.S. 71 Hwy.	Southport Pkwy.

SECONDARY ARTERIALS (continued)**SOUTH OF THE
RIVER (continued)**

STREET	FROM	TO
Admiral Blvd.	Broadway	The Paseo
Armour Blvd.	Broadway	The Paseo
Baltimore Ave.	9th St.	Southwest Blvd.
Belleview Ave.	43rd St.	Ward Pkwy.
Benton Blvd.	St. John Ave.	Swope Pkwy.
Blue River Rd.	Bruce R. Watkins Dr.	Oldham Rd.
Blue Ridge Blvd.	Independence City Limits	Raytown City Limits
Brooklyn Ave.	Independence Ave.	Brush Creek Blvd.
Brookside Rd.	Meyer Blvd.	85th St.
Brush Creek Blvd.	Bruce R. Watkins Dr.	Paseo Blvd.
Charlotte St.	Linwood Blvd.	Independence Ave.
Cleveland Ave.	Truman Rd.	Swope Pkwy.
Cleveland Ave.	Meyer Blvd.	Gregory Blvd.
Food Lane Rd.	Longview Rd.	M-150
Gillham Rd./ Gillham Plaza	Pershing Rd.	Rockhill Rd. at 42nd St.
Genessee	12th St.	23rd St. Viaduct
Grand Ave.	I-70	27th St. at Main

SECTION 01700.B - Street Guide

SECONDARY ARTERIALS (continued)**SOUTH OF THE
RIVER (continued)**

STREET	FROM	TO
Grandview Rd.	Blue River Rd.	Martha Truman Rd.
Gregory Blvd.	Ward Pkwy.	Bruce R. Watkins Dr.
Hickory St.	9th St.	I-670
Hickman Mills Dr.	Bannister Rd.	U.S. 71
Hickman Mills Dr. Ext.	Bannister Rd.	87th St.
Hillcrest Rd.	87th St.	Bannister Rd.
Holmes Rd.	9th St.	31st St.
Holmes Rd.	Rockhill Rd. at 66th St.	Bannister Rd.
Jackson Ave.	Linwood Blvd.	Truman Rd.
Jackson Ave.	Red Bridge Rd.	Grandview Rd.
James A. Reed Rd.	West Longview Pkwy.	63rd St. Trfwy.
Kenneth Rd.	21st Century Pkwy.	Prospect
Leeds Trfwy.	Van Brunt Blvd.	Stadium Dr.
Lee's Summit Rd.	I-70	East City Limits
Linwood Blvd.	Broadway	Van Brunt Blvd.
Longview Rd.	Grandview Rd.	Raytown Rd.
Madison Ave.	43rd St.	47th St.
Meyer Blvd.	Ward Pkwy.	The Paseo

SECTION 01700.B - Street Guide

SECONDARY ARTERIALS (continued)**SOUTH OF THE
RIVER (continued)**

STREET	FROM	TO
Norfleet Rd.	47th St.	63rd St. Trfwy.
Oak St.	I-70	Pershing Rd.
Oldham Rd.	Gregory Blvd.	87th St.
Ozark Rd.	I-435	Raytown Rd.
Pershing Rd.	West Pennway	Gillham Rd.
Prospect Ave.	Independence Ave.	Blue River Rd.
Prospect Ave.	139th St.	Kenneth Rd.
Red Bridge Rd.	U.S. 71	Blue Ridge Blvd.
Rhinehart Rd.	East City Limits	Gregory Blvd. Ext.
Roanoke Pkwy.	43rd St.	Ward Pkwy.
Rockhill Rd.	42nd St.	Holmes Rd. at 66th Terr.
St. John Ave.	Benton Blvd.	Chouteau Trfwy.
Sni-A-Bar Rd.	Blue Pkwy.	I-435
Southport Pkwy.	State Hwy. 150	155th St.
State Line Rd.	Shawnee Mission Pkwy.	75th St.
Sterling Ave.	I-70	South City Limits
Swope Pkwy.	Benton Blvd.	Meyer Blvd.
Troost Ave.	Independence Ave.	Bannister Rd.

SECTION 01700.B - Street Guide

SECONDARY ARTERIALS (continued)

SOUTH OF THE RIVER (continued)

<u>STREET</u>	<u>FROM</u>	<u>TO</u>
Velie Rd.	Blue Ridge Blvd.	Lee's Summit Rd.
Winchester Ave.	Independence Ave.	Truman Rd.
Winner Rd.	9th St.	Independence Ave.
Woodland Ave.	79th St.	85th St.
Wornall Rd.	Ward Pkwy at 48th St.	Ward Pkwy (north of Bannister)
Wornall Rd.	Bannister Rd.	135th St.
Wyandotte St.	I-70	Southwest Blvd.
Wyoming St.	12th St.	23rd St. Viaduct

APPENDIX A - MAJOR STREETS INVENTORY

FREEWAYS

NORTH OF THE RIVER	STREET	FROM	TO
	I-29	Missouri River	North City Limits
	I-35	Missouri River	North City Limits
	I-435 (West)	Missouri River	I-29
	I-435 (North)	I-29	M-291
	I-435 (East)	Missouri River	M-291
	I-635	Missouri River	I-29
	M-152	I-435 (West)	I-435 (East)
	M-210	I-29	I-435 (East)
	U.S. 169	I-29	North City Limits

EXPRESSWAYS

NORTH OF THE RIVER			
	N. Chouteau Trfwy.	Missouri River	M-210
	N. Broadway Ext.	Missouri River	I-29
	N. Burlington (M-9)	Missouri River	N. Broadway Ext.
	M-92 (relocated)	I-29	N.W. Interurban Rd.
	M-152	I-435 (East)	M-291
	M-291	M-210	I-35

SECTION 01700.B - Street Guide

EXPRESSWAYS (continued)

NORTH OF

THE RIVER (continued)

<u>STREET</u>	<u>FROM</u>	<u>TO</u>
M-291	I-35	I-435 (East)
River Rd. (M-9)	I-635	N. Broadway Ext.

PRIMARY ARTERIALS

NORTH OF THE RIVER

M-45 & N.W. 64th St.	I-435 (West)	I-29
N.E. 42nd/Parvin Rd. Diagonal	N. Oak Trfwy.	I-35
N.W. 68th St.	Line Creek Pkwy.	Kansas City City Limits
N.W. 68th St./ N.W. 64th St. Diagonal	I-29	Line Creek Pkwy.
N.E. 72nd St.	Gladstone City Limits	Maplewood Pkwy.
N.W. 96th St.	Line Creek Pkwy.	U.S. 169
N.E. 96th St.	U.S. 169	Maplewood Pkwy.
N.E. 96th St.	Shoal Creek Pkwy.	M-291
N.W. 100th St.	I-435 (West)	N.W. Tiffany Springs Pkwy.
N.E. 108th St.	Shoal Creek Pkwy.	M-291
N.W. 108th St./ N.W. 112th Diagonal	N.W. Skyview Ave.	N. Congress Ave.

SECTION 01700.B - Street Guide

PRIMARY ARTERIALS (continued)

NORTH OF

THE RIVER (continued)

<u>STREET</u>	<u>FROM</u>	<u>TO</u>
N.W. 108th St.	N.W. Skyview Ave.	Shoal Creek Pkwy.
N.W. 112th St.	KCI Airport	N.W. Interurban Rd.
N.W. 128th St.	Mexico City Ave.	N.W. Arrowhead Trfwy. (U.S. 169)
N.E. 132nd St./ 128th St. Diagonal	N.W. Arrowhead Trfwy. (U.S. 169)	East City Limits
N. Amity Ave.	N.W. Barry Rd.	N.W. 112th St.
N. Antioch Rd.	M-210	M-152
N.W./N.E. Barry Rd.	Platte County Rtes. "N" & "T"	Shoal Creek Pkwy.
N. Brighton Ave.	M-152 (relocated)	M-210
Chouteau Pkwy.	M-210	Englewood Blvd.
N.W./N.E. L.P.Cookingham Dr.	I-29	I-435 (East)
Englewood Blvd.	Line Creek Pkwy.	N.E. Antioch Rd.
N. Executive Hills Blvd.	N.W. Barry Rd.	N.W. Tiffany Springs Pkwy.
N. Green Hills Dr.	N.W. 79th St.	N.W. 108th St.
N. Indiana Ave.	M-152	Shoal Creek Pkwy.
Liberty Blvd. (U.S. 69)	Ruth Ewing Rd. (at I-35)	I-35 (at Vivion Rd.)
Line Creek Pkwy.	Englewood Blvd.	Shoal Creek Pkwy.

SECTION 01700.B - Street Guide

PRIMARY ARTERIALS (continued)**NORTH OF****THE RIVER (continued)**

STREET	FROM	TO
Maplewood Pkwy.	I-35	Shoal Creek Pkwy.
N. Mersington Ave.	Shoal Creek Pkwy.	I-435 (North)
Mexico City Ave.	N.W. 128th St.	KCI Airport
N. Oak Trfwy.	N. Burlington	Northeast L.P. Cookingham Dr.
N.E. Parvin Rd.	I-35	I-435 (East)
Platte City Rtes. "N" & "T"	River Rd.	M-152
N.E. Pleasant Valley Rd.	East of Gladstone City Limits	I-35
Searcy Creek Pkwy.	M-210	Maplewood Pkwy at I-35
Shoal Creek Pkwy.	Line Creek Pkwy.	Maplewood Pkwy.
N.W. Skyview Ave.	N. Executive Hills Blvd.	North City Limits
Tiffany Springs Pkwy.	West of N. Childress Ave.	Line Creek Pkwy.
N.W./N.E. Vivion Rd.	Highway AA	I-35
N.W. Waukomis Dr.	N.W. Vivion Rd.	N.W. 56th St.
N.W. Waukomis Dr.	N.W. 68th St.	N.W. 79th St.
N. Woodland Ave.	Shoal Creek Pkwy.	North City Limits

SECONDARY ARTERIALS

**NORTH
OF THE RIVER**

STREET	FROM	TO
M-9	River Rd.	N.W. Barry Rd.
N.E. 48th St.	N. Brighton Ave.	N. Hughes
N.W. 56th St.	Coffey Rd.	Line Creek Pkwy.
N.W. 72nd St.	M-9	N. Baughman Rd.
N.W. 73rd St.	N.W. Mace Rd.	M-9
N.E. 76th St.	N. Brighton	East City Limits
N.W. 79th St.	N.W. Barry Brook Dr.	Line Creek Pkwy.
N.E. 96th St.	Maplewood Pkwy.	Shoal Creek Pkwy.
N.E. 104th St.	M-291	East City Limits
N.E. 112th St.	M-291	East City Limits
N.W. 136th St.	N. Bethel Ave.	East City Limits
N.W. 136th St.	Hwy. N	N. Bethel Ave.
Hwy. AA	M-9	I-29
N. Agnes Ave.	Northeast L.P. Cookingham Dr.	North City Limits
N. Ambassador Dr.	N.W. 104th St.	N.W. 128th St.

SECONDARY ARTERIALS (continued)**NORTH OF THE
RIVER (continued)**

STREET	FROM	TO
N.W. Barry Brook Dr.	N.W. Barry Rd.	N.W. 79th St.
N. Bethel Ave.	N.W. 136th	North City Limits
N. Brighton Ave.	M-152	Shoal Creek Pkwy.
N. Baughman Rd.	Line Creek Pkwy.	Northwest L.P. Cookingham Dr.
N. Childress Ave.	River Rd.	Tiffany Springs Pkwy.
N. Congress Ave.	N.W. Barry Rd.	Tiffany Springs Pkwy.
N. Congress Ave.	N. Executive Hills Blvd.	N.W. 128th St.
N.E. Davidson Rd.	N.E. Parvin Rd.	N.E. Vivion Rd.
N. Eastern Rd.	N.E. 96th St.	North City Limits
N. Executive Hills Blvd.	Tiffany Springs Pkwy.	N.E. 104th St.
First Creek Rd.	Northwest L.P. Cookingham Dr.	North City Limits
N. Flintlock Rd.	N.E. 76th St.	M-291
N. Hampton Rd.	M-152	N.W. 100th St. (Farley Rd.)
N. Home Ave.	N.E. 104th St.	North City Limits

SECTION 01700.B - Street Guide

SECONDARY ARTERIALS (continued)**NORTH OF THE
RIVER (continued)**

STREET	FROM	TO
N. Hughes Rd.	M-210	S. Liberty Pkwy. Corridor
N.W. Interurban Rd.	N.W. 128th St.	North City Limits
N.W. Mace Rd.	M-9	N.W. Barry Rd.
N. Mersington	I-435 (North)	North City Limits
Mexico City Ave.	N.W. 128th St.	North City Limits
N. Northwood	M-9	N.W. 64th St.
N.E. Parvin Rd.	I-435 (East)	M-210
N. Robinhood Lane	Line Creek Pkwy.	North City Limits
N.E. Sherman Rd.	M-291	North City Limits
N. Stark Ave.	M-291	North City Limits
Tiffany Park Rd.	I-435	N. Hampton Rd.
N.W. Tiffany Springs Rd.	N. Childress Ave.	N. Baughman Rd.
N. Topping Ave.	Shoal Creek Pkwy.	Northeast L.P. Cookingham Dr.
N. Winan Ave.	N. Ambassador Dr.	North City Limits

Section 01800

OPERATIONAL CHANGE CONTROL PLAN (OCCP)

Part 1 - GENERAL.

1.1 PURPOSE. The City relies on each facility included in this project for conveyance and/or treatment of combined sewage for the designated service area prior to discharging to the Missouri River. There can be no interference or disruption to the operational capabilities of the facilities. The facilities shall be considered “operational” when they are capable of treating or conveying the entire quantity of wastewater received to the water quality limits specified in the discharge permit.

It is essential that any activity by on-site maintenance staff or outside contractor at any facility under the control of the Owner which would call for any plant shut down, be carefully planned to be within the requirements of the SCADA System Calibration, Testing, Training, and Commissioning Section. To assist in a successful maintenance or construction project, the Owner has developed an Operational Change Control Plan (OCCP).

The purpose of the plan is to perform all work in an expeditious manner, to prevent excessive shutdowns, to conform to all rules and regulations of Owner to minimize shutdown time, and to allow for contingencies. The Contractor shall incorporate the requirements defined in the OCCP into its construction schedule.

In addition to the shutdown requirements, the OCCP requires that all safety and health risks germane to the project be thoroughly anticipated, investigated and proper prevention procedures put into place. The Contractor shall integrate its procedures and any additional health and safety requirements of the Owner into the OCCP.

Under the terms of this contract, the Contractor shall complete the formation of an OCCP for each relative facility for any shutdown or outage. A Figure 1-01800 OCCP template is attached at the end of this section.

No consideration will be given for claims for additional time and cost associated with preparing the OCCPs required by the Owner and Engineer to complete this work in a manner that facilitates proper operation of the facility.

1.2 DEFINITIONS.

1.2.01. Shutdown. For the purposes of this OCCP, “Shutdown” shall mean any activity at any facility (Treatment or any Pump Station facility) where the wastewater flow must be either interrupted or shut off for any length of time or the

monitoring of the treatment system will be taken off-line. Doing so will require a thorough and comprehensive guide as to exact process for the intended activity as defined and clearly outlined in the OCCP template.

1.3 SHUTDOWN AND CONSTRUCTION CONSTRAINTS

1.3.01. General shutdown constraints. The work will be executed while the existing facilities are in operation and some activities may be accomplished without a shutdown. Any activity that disrupts plant or utility operations must comply with these shutdown constraints. Contractor shall:

- Organize work to be completed in a minimum number of shutdowns.
- Provide thorough advanced planning, including having required equipment, materials, and labor on hand at the time of the shutdown.
- Final determination of the permitting of shutdowns will be the sole judgement of the Owner.
- Owner maintains the ability to abort on the day of the scheduled shutdown.

1.4 OVERVIEW OF THE OCCP. Any portion of any treatment facility, pump station, or piece of instrumentation shutdowns or other components taken out of service affecting wastewater treatment (or pumping flow conditions) must be preceded by an Operational Control Change Plan (OCCP). Each shutdown will require an additional unique OCCP to be completed by the Contractor for Owner review. Refer to Section 01800 F1 for OCCP documents and additional requirements.

1.5 STEPS. The basic steps in the OCCP plan are outlined as follows:

- A. Key Plan information
- B. Works to be completed prior to start of OCCP
- C. Plant Condition Required for any prolonged Plant Shutdown
- D. Contingency Actions
- E. Affected monitoring points and impact
- F. Shutdown Steps
- G. Facility Restart

01800 – Operational Change Control Plan (OCCP)

H. Distribution List

Part 2 - PRODUCTS. Not Used.

Part 3 - EXECUTION

3.1 OCCP COMPLETION. The Contractor shall evaluate the templates for the several facilities and complete the plan for each site. The completed plans shall be submitted to the designated Water Services Representative for review and approval. The Contractor is not obligated to submit the plan for all locations at the same time but must submit periodically to maintain conformance with the construction schedule.

The Owner will respond within five (5) working days.

The Contractor may alter the means and methods outlined in the plans subject to the review and approval of the Owner.

LOCATIONS. Multiple plans are necessary; this contract has a **minimum of (30) thirty anticipated plans.** See the SCADA System Calibration, Testing, Training, and Commissioning Section for more detail. the SCADA System Calibration, Testing, Training, and Commissioning Section

End of Section



Wastewater Treatment Division Operational Change Control Plan (OCCP)

Date of publication OCCP # *Review the list of completed OCCP's and use the next sequential #.*

Asset Name/ Number: TBD

Section: Treatment Plant/Pump Station

Date of commencement: TBD

Date of completion: TBD

Description of Works: *Provide a general description of the work activity performed under the OCCP. The intent of this section is to provide a short narrative of the work; however it will be important to put in enough detail for someone not intimately familiar with the work to understand the general work activities and any special hazards associated with the job. This section also provides a good starting point in providing the work force with a Pre-Job Brief before starting the work.*

Key Plan information

Description of Hold Point 1	<i>Place a general description of the major hold points anticipated in the execution of the work. Examples of a hold point to place in this section include:</i> <ul style="list-style-type: none"> • <i>Required work permits</i> • <i>Required pre work inspections.</i> • <i>Installation of specialized safety equipment</i> • <i>Required management approval to proceed with phased work activities</i> • <i>Weather conditions which would require termination of work activities</i> • <i>Regulatory inspection requirements</i> • <i>Requirements for Public Notification</i> • <i>Water Divergences or Outages</i> • <i>Formal Turnover to Third Party Vendors (e.g. during construction activities, etc.)</i> • <i>Road Closure or Traffic Revisions (include contact with the WS Public Affairs Officer where road closures are non- emergency in nature. For emergency road closures contact the PAO as soon as possible)</i>
Description of Hold Point 2	
Description of Hold Point 3	
WS Treatment Plant(s) Manager (Assigned Responsible Person for all matters related to plant operations or bypass oversight)	<i>Name and Phone # of principle personnel in charge of work activities or a resource in the event issues must be resolved.</i> <i>NOTE: If a group is not involved in the work activity, delete the individual section. Also, should others not be listed below, the person completing the OCCP will add new listings as deemed appropriate.</i>
WS Engineer	
WS Reviewing Officer/Supervising Engineer.	
WS Maintenance Superintendent	
WS Maintenance Supervisor	



Water Services Divisional Operations Manager (Assigned Responsible Person for all matters related to plant operations or bypass oversight)	
Water Services Divisional Maintenance Manager (Assigned Responsible Person for all matters related to plant maintenance oversight)	
Coordination Meeting Date	<i>Put down dates for completed or anticipated coordination meetings. This will allow personnel involved in the OCCP project to meet and discuss work status and schedules.</i>
Pre-Job Coordination Meeting Date:	<i>Include both the date (use TBD where a date has not been identified) and a listing of all groups requiring the pre-job briefing (e.g. operations/maintenance crew, contractors, specialists, managers, etc.)</i>

Work to be completed prior start of OCCP

Plant Condition Required for OCCP

Operational Condition	Contingency Action
<i>Conditions which must be met in order to successfully complete the work activity.</i>	<i>Describe conditions which must be met and potential work activities in order to ensure the Operational Condition have been met prior to progressing the OCCP work schedule.</i>

Contingency Actions

Mode of Failure/Incident	Contingency Action
<i>Discuss potential failure modes or conditions which may interrupt the completion of the OCCP work schedule</i>	<i>Discuss potential work activities for identified problems or unacceptable work conditions</i>

Affected monitoring points and impact

a) Distribution System Level Maintenance

Description of Element	How is it affected
<i>Describe effect on the treatment plant, distribution system or environment which may result in the</i>	<i>Discuss how the plant, distribution system or environment will be affected by the items listed in the "Description of Element". Be specific concerning the anticipated impact and what mitigation can be taken to minimize adverse impact.</i>



<i>implementation of the OCCP</i>	
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b) Special points established for this operation

Description of point	Describe expectations
<i>Describe special requirements established by the Hold Points.</i>	<p><i>Discuss in specific detail all work actions, notifications and emergency response actions to be taken at each hold point.</i></p> <p><i>This section is intended to expand on the Hold Points identified above and explain the expectations of management in complying with those hold points. Use whatever detail is required in order for a third party observer to understand what is expected by the work team in meeting hold point conditions.</i></p> <ul style="list-style-type: none"> <i>• Describe the anticipated outcome of compliance with the Hold Point (e.g. notification completed, not adversely impacting distribution system, Completion of pre-requisite work activities before moving on too next work phase, specific regulatory compliance requirement)</i> <i>• Specialize equipment required to complete the OCCP</i> <i>• Potential impacts on customers or governmental properties</i> <i>• Operational conditions adversely impacting NPDES compliance</i> <i>• Operational conditions adversely impacting the Process Management Plan</i> <i>• Adverse impact on the collection system or pump stations</i> <i>• Identified Safety Hazards where “Hold Points” must be signed off on before progression of the work.</i> <i>• ETC.</i> <p><i>NOTE: All “HOLD POINTS” must have a corresponding description in this section.</i></p>

c) Treatment Plant(s) affected

Description of Treatment Plant	How is it affected
<i>Identify any treatment plant(s) impacted by the OCCP (by name)</i>	<p><i>Describe what impacts can be expected by the implementation of the OCCP (e.g. safety, process, equipment, special sampling requirements, etc.)</i></p> <p><i>NOTE: Make sure impacts with potential NPDES impacts are addressed as an OCCP “Hold Point”.</i></p>

d) Alarm modifications for use in monitoring operation

Alarm name	Alarm Level	New Alarm Level	Comments
			<i>Identify any changes to alarm settings which would result from the implementation of the OCCP.</i>

e) Environmental spill risks

Description of spill risks	Mitigating controls
	<i>Identify any special controls implemented to prevent the risk of Distribution Systems Flushing to the environment.</i>

Water quality impacts

Description of Impact	How it will be managed
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Identify the potential impacts with enough detail for clarity (e.g. NPDES violations, human health impact potential, boil water advisories, etc.)

Describe how responsible personnel will control potential impacts and what actions must be taken in the event implementation of the OCCP results in a NPDES violation(s), water quality impact, human health impact, boil water advisory, etc.



Bypass Steps

Step	Description	Team	Time start	Time end
HOLD POINT <i>(List Hold Points relevant to potential facility bypasses)</i>	<i>Describe in detail all activities taken while performing a treatment plant facility bypass. Refer to the Standard Operational Procedure for Facility Bypass or Engineered Bypass.</i> <i>NOTE: This section need only be filled out where a facility bypass is anticipated to result from the implementation of the OCCP.</i>			
DISCONTINUE BYPASS				
NOTIFY WS and MANAGERS of WORK COMPLETION				

SHUTDOWN STEPS

Step	Description	Team	Time start	Time end
<i>Describe steps needed for any facility shutdown (e.g. Plant, Pump Station, Distribution System)</i>	<i>Describe the specific work steps to be followed in order to complete an orderly shutdown of equipment or facilities. Include activities such as:</i> <ul style="list-style-type: none"> <i>• Equipment staging (be specific)</i> <i>• Preliminary work to be completed prior to shutdown (be specific)</i> <i>• Implementation of specific safety activities (e.g. LOTO, gas monitoring, excavation permits, lane closures/traffic revisions, etc.)</i> <i>• Work turnover requirements</i> <i>• Mandatory inspections</i> <i>• Potential treatment plant/system impacts</i> <i>• ETC.</i> 			

Recommissioning

Notes for “SHUTDOWN STEPS” apply.

FACILITY RE-START

Step	Description	Team	Time start	Time end
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<i>Describe all activities necessary to restart to facility (e.g. plant, pump station or distribution system)</i>	<i>Provide "Step-by-Step" restart instruction to ensure the facilities taken off line by the OCCP are fully restarted and normal operations is obtained prior to close out of this section of the OCCP.</i>			
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Distribution List

WSD Positions	Name and Phone Numbers (where single)	Criteria
Relevant Personnel	<i>List personnel who would be relevant to response in the event issues are encountered through the execution of the OCCP which were not anticipated or are of an emergency nature.</i>	<i>Whole Plan</i>
Operations Manager	<i>Name & Phone Number</i>	<i>Whole Plan</i>
Operations Superintendent	<i>Name & Phone Number</i>	<i>Whole Plan</i>
Maintenance Manager	<i>Name & Phone Number</i>	<i>Whole Plan</i>
Maintenance Superintendent	<i>Name & Phone Number</i>	<i>Whole Plan</i>
Utility Officer(s)	<i>Name & Phone Number</i>	<i>Whole Plan</i>
MDNR/EPA Environmental Compliance	<i>Name & Phone Number</i>	<i>Whole Plan</i>

Section 01820 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 DESCRIPTION. This section contains requirements for training the Owner's personnel in the proper operation and maintenance of the equipment and systems installed under this contract.

1.02 GENERAL. Where indicated in the Equipment Schedule section and as required by the specifications, the manufacturer's representative shall provide on-the-job training of the Owner's personnel. The training sessions shall be conducted by qualified, experienced, factory trained representatives of the various equipment manufacturers. Training shall include instruction in both operation and maintenance of the subject equipment.

1.03 SUBMITTALS. The following information shall be submitted to the Engineer in accordance with the provisions of the Submittals section. The material shall be submitted not less than 4 weeks prior to the provision of training.

1. Lesson plans, training manuals, handouts, visual aids, and other reference materials for each training session to be conducted by the manufacturer's representatives.
2. Subject of each training session, identity and qualifications of individuals to be conducting the training, and tentative date and time of each training session.

PART 2 – PRODUCTS

2.01 GENERAL. Where specified, the Contractor shall conduct training sessions for the Owner's personnel to instruct staff on the proper operation, care, and maintenance of the equipment and systems installed under this contract. Training shall take place at the site of the work and under the conditions specified in the following paragraphs. Approved operation and maintenance manuals shall be available at least 30 days prior to the date schedule for the individual training session.

2.02 LOCATION. Training sessions shall take place at the site of the work at a location designated by the Owner.

2.03 LESSON PLANS. Formal written lesson plans shall be prepared for each training session. Lesson plans shall contain an outline of the material to be presented along with a description of the visual aids to be utilized during the sessions. Each plan shall contain time allocation for each subject.

One complete set of originals of the lesson plans, training manuals, handouts, visual aids and reference materials shall be the property of the Owner and shall be suitable bound for proper organization and easy reproduction. The Contractor shall furnish ten (10) copies of necessary training manuals, handouts, visual aids, and reference materials at least one (1) week prior to each training session.

2.04 FORMAT AND CONTENT. Each training session shall include classroom and time at the location of the subject equipment or system. As a minimum, training sessions shall cover the following subjects for each item of equipment or system:

1. Familiarization
 - a. Review catalog, parts lists, drawings, etc, which have been previously provided for the plan files and operation and maintenance manuals.
 - b. Guided inspection of the subject equipment.
 - c. Demonstration of the subject equipment and how operation in accordance with the specified requirements.
2. Safety
 - a. Review and demonstration of safety procedures and related documentation.
 - b. Inspection and discussion of hazardous components of the subject equipment.
3. Operation
 - a. Review of subject equipment operations literature and theory of operation.
 - b. Overview of equipment operation and function.
 - c. Explanation and demonstration of all modes of operation including start up, shut down, normal, and emergency operation, and manual and automatic operation through the plant control system.
 - d. Explanation of all hardwired interlocks.
 - e. Explanation and demonstration of equipment related valves and their purpose.
 - f. Explanation of all equipment related instruments including primary element, instrument indicator, purpose, and interpretation of information.
 - g. Check out of Owner's personnel on proper use of the equipment.
4. Preventive maintenance
 - a. Review preventative maintenance documentation and discussion of maintenance require at various intervals; e.g. daily, weekly, monthly, annually.
 - b. Demonstrate performance of each preventive maintenance task.
 - c. Identification of indicators of equipment problems.
 - d. Discussion of corrosion protection and lubrication requirements.
 - e. Requirements for periodic exercise of equipment and demonstration of equipment exercise where required.
 - f. Identification of inspection points and demonstration of inspection covers removal and routine disassembly and assembly of equipment.
5. Corrective Maintenance and Equipment Repair
 - a. Discussion of common repairs and identification of special problems.
 - b. Explanation and demonstration of equipment inspection and troubleshooting.
 - c. Demonstration of calibration procedures.
 - d. Demonstration of repair procedures where practical.
6. Parts

- a. Discussion of the parts list and ordering of parts.
- b. Review of spare parts provided with the equipment and identification of other recommended spare part.

7. Local Representatives

- a. Name, address, telephone of local representative.
- b. Review of contact information for providers of routine and emergency repair and operational assistance.

8. Operation and Maintenance Manuals

- a. Review of O&M manual content and organization.
- b. Update O&M material as required.

2.05 VIDEO RECORDING. The Contractor shall record each training session and shall give the Owner exclusive rights to each training session recording. The Contractor shall advise all manufacturers providing training sessions that the material will be recorded.

Video recorded sessions shall be saved to a USB drive (1 copy) and uploaded to a City server/website (specific address TBD) (1 copy) for delivery to Owner. Pre-recorded videos of System Supplier's standard training programs may be substituted if they cover the same topics and are developed for the same versions of hardware and software. Furnishing videos of standard training programs shall not relieve Contractor from any of the training requirements specified herein.

PART 3 – EXECUTION

Training shall be conducted in conjunction with the operational testing and commissioning periods. Classes shall be scheduled so that training is performed when equipment is available for operation. The Contractor shall arrange to have the training conducted on consecutive days, with no more than 6 hours of class scheduled for any one day. Concurrent classes will not be permitted.

End of Section

04220 - CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units (standard and burnished).
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Embedded flashing.
6. Miscellaneous masonry accessories.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product
- B. Shop Drawings: For the following:
 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: From testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units (standard and burnished).
 - a. Include data on material properties.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Integral water repellent used in CMUs.
 - 3. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 4. Mortar admixtures.
 - 5. Preblended, colored dry mortar mixes. Include description of type and proportions of ingredients.
 - 6. Grout mixes. Include description of type and proportions of ingredients.
 - 7. Reinforcing bars.
 - 8. Joint reinforcement.
 - 9. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockups for typical exterior and interior walls in sizes approximately 60 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - 3. Protect accepted mockups from the elements with weather-resistant membrane.
 - 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Acceptance Testing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS (NOT USED)

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 and ASTM C-90 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide round-edged units for outside corners unless otherwise indicated.
 - 3. All units exposed to view in interior areas where they are subjected to wash down are to be burnished CMU's
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) ACM Chemistries.

- 2) BASF Corporation.
- 3) Euclid Chemical Company (The); an RPM company.

C. CMU's: ASTM C-90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi and as required by design engineer.
2. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.

2.5 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

- B. Hydrated Lime: ASTM C 207, Type S.

- C. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

- D. Aggregate for Grout: ASTM C 404.

- E. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Corporation.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. GCP Applied Technologies Inc.

- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Corporation.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. GCP Applied Technologies Inc.

- G. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Dur-O-Wal, a Hohmann & Barnard company.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc.

- C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
 1. Interior Walls: Hot-dip galvanized carbon steel.
 2. Exterior Walls: Hot-dip galvanized carbon steel.
 3. Wire Size for Side Rods: 0.187-inch diameter.
 4. Wire Size for Cross Rods: 0.187-inch diameter.
 5. Spacing of Cross Rods: Not more than 16 inches o.c.
 6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.8 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.
 - 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch-diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to Concrete or CMU units: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Heckmann Pos-I-Tie barrel screw. Barrel screw length to match rigid insulation thickness.
 - 2. Provide Heckmann ThermalGrip 2" CI washer.
 - 3. Tie Section: Triangular-shaped wire tie made from 0.1875-inch-diameter, hot-dip galvanized steel wire.
- E. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.9 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch thick.
 2. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
 3. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam sheds water.
 4. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 5. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
 6. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
 7. Solder metal items at corners.
- B. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
 4. Where flashing is fully concealed, use metal flashing.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.11 MASONRY CELL FILL MATERIAL

- A. Fill cells of all interior partitions with Lightweight-Aggregate Fill per ASTM C331/C331M unless cells are to receive grout. Fill is to achieve STC-50 rating.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use Portland cement-lime mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type S.
- C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of Portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
 - 3. Mix to match Architect's sample.

4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Burnished CMUs.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide

clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches vertically under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- F. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY CELL FILL MATERIAL

- A. Fill cells of all interior partitions with Lightweight-Aggregate Fill per ASTM C331/C331M unless cells are to receive grout. Fill is to achieve STC-50 rating.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

04220 – Concrete Masonry Units

1. Provide an open space to allow for the rigid insulation plus a minimum of 1 inch clear space between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid insulation materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 2. Install preformed control-joint gaskets designed to fit standard sash block.
 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.10 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.11 FLASHING

- A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

2. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant.
 3. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.12 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

04300 - BRICK VENEER

PART 1 - GENERAL

1.1 SCOPE.

- A. This section covers the furnishing and installing of building masonry. Ceramic tile and masonry water-repellant or stain coatings are covered in other sections.

1.2 GENERAL.

- A. Building masonry shall be constructed of units of the types, dimensions, arrangements, and coursing indicated on the Drawings and specified herein, complete with all materials, accessories, and appurtenances indicated and specified.
- B. All work shall be in accordance with TMS 602 except as modified herein.

1.3 DELIVERY, STORAGE, AND HANDLING.

- A. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.
- B. All masonry units shall be handled in a manner which will prevent soiling, chipping, or damage of any kind. Broken, discolored, chipped, or otherwise damaged facing units will be rejected and shall be replaced with undamaged units.
- C. Masonry units shall be stored on pallets, shall be protected against contamination and staining, and shall be kept covered and dry at all times. Lime and cement shall be stored under cover in a dry place.
- D. Sand shall be stored so that the inclusion of foreign materials is prevented. Whenever sand is piled directly on the ground, the surface beneath the sand shall be smooth, well drained, and free from dust, mud, and debris. The bottom 6 inches [150 mm] of each pile shall not be used in mortar.
- E. Insulation shall be stored under cover in a dry place, and shall be protected from the weather at all times.

1.4 SUBMITTALS.

- A. Before masonry construction is begun, the following drawings, data, specimens, and samples shall be submitted in accordance with the Submittals Procedures section. Additional data shall be submitted as needed. If the source of a material is changed

during the course of the work, the tests and reports required for preliminary review of that material shall be resubmitted.

- B. Recycled Content: Documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
- C. Regional Materials: Documentation indicating location and distance from project of material manufacturer and point of extraction, harvest or recovery for each regional material and the fraction by weight that is considered regional.
- D. Specimens and color selection kits for all masonry units which will be used in the Work, showing range of colors, textures, finishes, and dimensions. Brick colors shall be submitted from at least five manufacturers.
- E. Samples of all masonry and mortar. At least two samples of each type of unit required shall be submitted.
- F. Color selection sample kits for integral mortar colors.
- G. One sample, at least 6 inches [150 mm] long, of each type of non-masonry joint material required.
- H. Control joint locations in the CMU wall.
- I. Shop drawings or manufacturers' literature showing details of anchors, ties, and metal accessories to be used in masonry construction.
- J. Bar lists and drawings for the fabrication and placement of reinforcement with sufficient elevations and sections to adequately detail and label all reinforcement.
- K. Cold and hot weather construction procedures.
- L. Certificates for the following materials used in masonry construction, indicating compliance with the standards herein.
 - 1. Mortar and grout materials, including manufacturer data for any admixture, mortar coloring, or other product added to the grout or mortar.
 - 2. Reinforcement.
 - 3. Anchors, ties, fasteners, and metal accessories.
- M. For each mortar mix, submit one of the following:
 - 1. For preblended (bagged) mortar mixes, qualification shall be by the property specifications of ASTM C270. Compressive strength test results submitted shall have been performed within the previous 12 months. All ingredients in the mortar mix shall be identified.

2. For mortar mixes where materials are blended on site (non-bagged), qualification shall be by the proportion specifications of ASTM C270. Types and proportions of all ingredients shall be submitted.
- N. For each grout mix, submit mix designs indicating type and proportions of ingredients in compliance with the specified compressive strength method of ASTM C476. Strength test results shall be from testing performed within the preceding 12 months.

1.5 COLOR SELECTION AND SAMPLE PANELS.

- A. Colors of brick veneer and colored mortar, will be selected from manufacturer's data and samples after the award of the contract.
1. Mortar Coloring. Integral mortar color will be selected from sample kits submitted. After general color selections have been made, mortar samples shall be prepared in mockups for color selection. As many samples as are necessary to make a proper selection shall be prepared. Preliminary color selections shall be used in constructing the sample panels. Mortar colors shall not be final until the sample panels have been accepted.
 2. Sample Panels. Before the installation of any brick veneer, sample panels shall be constructed at the Site incorporating each type of masonry material. Sufficient number of sample panels shall be constructed to show each type of exterior and interior wall configuration and bonding patterns indicated on the Drawings. Unless otherwise indicated or detailed on the Drawings, sample panels shall be 6'-8" [2.0 m] long by 4'-0" [1.2 m] high. Sample panels shall show the proposed color range, texture, bonding patterns, mortar joints, mortar color, and workmanship for masonry materials. Each panel shall be of the thickness indicated on the Drawings for building walls of similar construction. The panels shall be representative of each typical exterior and interior masonry wall construction indicated on the Drawings complete with, as applicable, masonry units, bonding patterns, joint reinforcement, wall ties, wall insulation, vertical steel, a typical bond beam, mortar color, mortar tooling, weeps, and flashings. Each sample panel shall include a typical control or expansion joint, as applicable, for each wythe of masonry, complete with filler strips and caulking as indicated on the Drawings. The sample panels shall not be incorporated into the work. No masonry work shall progress until Architect has accepted the sample panels. The panels shall then become the standard of comparison for all masonry work built of the same materials. The panels shall not be destroyed or moved until all masonry work is completed.
- B. At least one exterior wall panel shall include an exterior corner condition and an intersecting interior wall constructed as detailed on the Drawings.
- C. Sample panels shall include masonry waterproofing or stain, exterior insulation and finish system over masonry backup, and masonry veneer over non-masonry backup, as applicable for each wall.

1.6 BRICK ALLOWANCE.

- A. Unless otherwise indicated that the face brick match existing, Contractor's bid shall be based on the assumption that the net cost of the facing brick and that the net cost of special shapes, sizes, curved, or beveled units shall be as specified.
- B. When specified or indicated on the Drawings facing brick shall match existing brick, Contractor's bid shall be based on the cost of the brick product necessary for matching the existing brick. No adjustment to the contract price will be made.

PART 2 - PRODUCTS

2.1 MATERIALS.

- A. All acceptable masonry products are indicated below. Products necessary for the work are as specified or as indicated on the Drawings. Sizes of masonry units are nominal, the actual size being slightly smaller to allow for mortar joints.
 - 1. Facing Brick: ASTM C216, Grade SW, Type FBS; Type FBX for soldier courses; uncured brick for exposed top courses and special shapes where required by the Drawings.
 - a. Size: Standard
 - b. Color and Texture: Match existing brick.
 - 2. Mortar: ASTM C270, cement-lime, Type S. Preblended (bagged) dry mortar mix shall conform to ASTM C1714 and shall contain no additives or admixtures.
 - a. Sand: Natural sand in accordance with ASTM C144.
 - b. Portland Cement: ASTM C150, Type I.
 - c. Hydrated: ASTM C207, Type S. Lime
 - d. Quicklime: ASTM C5, pulverized.
 - e. Lime Putty: Quicklime, thoroughly slaked and stored for one day; kept moist until used.
 - f. Integral: ASTM C979, mineral pigments, natural or synthetic
 - g. Mortar Color: iron oxides, sun fast and water resistant, free of fillers and extenders. Soloman Grind-Chem Service, Inc. "A", "H", or "X" series.
 - h. False Joint: ANSI A118.4, Type S, Portland cement mortar with Mortar latex admixture, color to match mortar color.
 - i. Integral: Aluminum stearate, ammonium stearate, or calcium
 - j. Waterproofing stearate, 2 percent of weight of cement; W. R. Grace "Dry Block Mortar Admixture", A. C. Horn "Hydratite", or Sonneborn "Hydrocide".
 - 3. Anchors and Ties Alternate manufacturers and products may be submitted in lieu of the ones listed below. Alternates shall include published manufacturer's data for out-of-plane load capacities.

- a. Masonry Refer to specification section 04220 Concrete Veneer to Masonry Units.
 - 1) Concrete Wall
 - 2) Backup
 - 3) (Seismic Design Categories A and B)
- b. Masonry Refer to specification section 04220 Concrete Veneer to Masonry Units.
 - 1) CMU Wall
 - 2) Backup
 - 3) (Seismic Design Categories A and B)
- 4. Rigid Insulation for Masonry Cavity Walls
 - a. Owens Corning FOAMULAR High-R CW Plus
 - b. Extruded Polystyrene Rigid Foam Insulation. "R" value of 5.6 per inch minimum at 75°F [24°C] mean temperature and water vapor permeance of 1.5 perm-in. [1.5 ng/Pa s m]. Meets all ASTM C578 properties. Provide a minimum R-value of 9.5, in a continuous layer, in masonry cavity walls.
 - c. 1.5 perm-in. [1.5 ng/Pa s m]. Meets all ASTM C578 properties. Provide a minimum R-value of 9.5, in a continuous layer, in masonry cavity walls.
- 5. Insulation Adhesive
 - a. Rubber-based mastic adhesive as recommended by the insulation manufacturer.
- 6. Veneer Control and Expansion Joint Material
 - a. ASTM D1056, Class 2A1, closed-cell neoprene with pressure-sensitive adhesive back; Hohmann & Barnard "NS- Closed Cell Neoprene Sponge".
- 7. Structural Wall Preformed Control Joint Material
 - a. Rubber
 - 1) ASTM D2000, extruded rubber, Hohmann & Barnard
 - 2) "#RS Series"
 - b. PVC
 - 1) ASTM D2287, PVC, Hohmann & Barnard "VS Series".
- 8. Cavity Wall Drainage System
 - a. Total flash cavity-wall drainage system as manufactured by Mortar Net, USA LTD. Preassembled panels of pre-cut flexible flashing including built-in stainless steel termination bar with rubber grommet fasteners, vertical edge-dam, no-clog drainage matte, no-clog weep tabs, and stainlesssteel drip-edge are provided with the system. Flashing above masonry openings will have TPO membrane extend to face of veneer, without Stainless Steel drip edge. Mortar Net USA pre-formed 14" TPO inside and outside corner boots, TPO

end dams, stainless steel drip edge, adjustable metal factory outside corners and Total Flash Butyl adhesive are required.

9. Weep Vents

- a. High density polyethylene (HDPE) weep vents measuring 2 5/8"x3 1/2"x 1/2", color to match mortar color; Mortar Net Weep Vent.

10. Detergent Masonry Cleaner

- a. ProSoCo "Vana-Trol" or National Chem-Search "DC-6", unless otherwise recommended by the masonry unit manufacturer and accepted by Architect.
- b. Wall flashings are covered in the Sheet Metal section.

2.2 MORTAR.

- A. Mortar shall be cement-lime type; the use of masonry cement or mortar cement will not be acceptable.

1. Masonry Mortar.

- a. Masonry mortar that is preblended shall be qualified in accordance with the properties specifications of ASTM C270. Mortar that is site blended shall be qualified in accordance with the proportion specifications of ASTM C270.
- b. Integral waterproofing shall be added to each mortar mixture.
- c. White cement shall be substituted for Portland cement for cut stone mortar.

2. Integral Mortar Color.

- a. Integral mortar coloring shall be added to the mortar for masonry as specified herein. Each mortar color shall be of consistent color throughout the Project.

2.3 GROUT.

- A. Grout shall be proportioned in accordance with ASTM C476, by the specified compressive strength method. Only enough water shall be added to produce a mixture which is flowable, but which will not show an excess of water when placed. Unless otherwise specified, grout shall have a slump ranging from 8 to 11 inches [200 to 275 mm]. Self-consolidating grout shall have a slump flow of 24 to 30 inches in accordance with ASTM C1611, and shall have a Visual Stability Index of not greater than 1 as determined by ASTM C1611 Appendix X1.

PART 3 - EXECUTION

3.1 MORTAR.

A. Mixing.

1. The method of measurement of all mortar ingredients shall be accurate and shall ensure definite and uniform proportions. Mortar shall be machine mixed for at least 5 minutes and shall be used within 90 minutes after mixing. Mortar left when work is stopped shall be discarded. Remixing of mortar more than 90 minutes old with additional water, cement, or other materials will not be acceptable.
2. The integral mortar color manufacturer's mixing instructions and proportions shall be strictly adhered to. Following the addition of integral mortar color, the mortar shall be mixed in a powered mixer until a uniform color is obtained, but not less than 5 minutes.

B. Jointing.

1. General. Masonry shall be laid in straight, level, uniform courses, with mortar joints of uniform width. Head joints shall approximately equal the horizontal joints in width.
2. Joints in masonry surfaces which are to be covered or not exposed shall be struck flush.
3. All exterior and exposed interior mortar joints, except joints in glazed materials, joints in walls which are to be covered, and joints which are to be raked, shall be tooled to a smooth uniform surface and shall be finished free of voids using a rounded tool. Mortar joints specified to be caulked shall be raked to a depth of 1/2 inch [12.7 mm]. Tooling of joints shall be regulated so that the mortar for each wall space has a uniform appearance.
4. The filling of masonry joints shall mean that the entire space between abutting surfaces of units is full, and that the body of the mortar is forced against and into the porous surface of each unit.

C. Brick.

1. Standard brick shall be laid so that three courses will produce 8 inches [200 mm] of wall height.
2. All head joints in brick facings shall be completely filled with mortar. Additional mortar shall be placed in the upper part of the head joint and sufficient pressure exerted to force it out the full depth of the joint.

3.2 BONDING AND REINFORCING.

A. Bonding.

1. Except where otherwise indicated on the Drawings, all facing brick shall be laid in a running bond pattern.

B. Joint Reinforcing.

1. Joints in horizontal masonry units shall be reinforced as specified, unless otherwise indicated on the Drawings.
2. The width of joint reinforcement (side rod to side rod) shall be approximately 2 inches [50 mm] less than the nominal overall thickness of the wall in which it is placed. All joint reinforcement shall be fully embedded in mortar and shall be covered with at least 5/8 inch [15 mm] of mortar on the exterior face
3. Joint reinforcing shall be discontinuous at control and expansion joints. The ends of sections of joint reinforcement shall be lapped at least 8 inches [200 mm] with the next section. At corners and intersections, prefabricated corner and tee reinforcing pieces shall be used.

C. Brick Facing for Concrete.

1. Brick facing for concrete construction shall have mortar joints reinforced within 6 feet [1.8 m] of corners. Reinforcement shall be ladder type joint reinforcement and prefabricated corner reinforcement pieces, spaced not more than 8 inches [200 mm] apart vertically.

D. Masonry Anchorage.

1. Masonry anchorage to an abutting structure or to backup construction shall be as specified herein, unless indicated otherwise on the Drawings.

E. Brick Veneer to CMU, Concrete.

1. Brick veneer for CMU or concrete shall be anchored to the backup substrate. At a minimum, one anchor shall be provided for each 1.87 square feet [0.17 m²] of veneer. Maximum spacing of anchors shall be 18 inches [450 mm] in either direction. At openings larger than 16 inches [400 mm] in either direction, additional anchors shall be provided within 12 inches [300 mm] of the opening, and spaced at not more than 2'-0" [600 mm] around the perimeter of the opening.

F. Grout.

1. Unless otherwise acceptable to Architect, grout shall be placed in lifts not to exceed 5 feet [1.5 m]. Lifts exceeding 12 inches [300 mm] in height shall be consolidated by mechanical vibration and reconsolidated after initial water loss and settlement. Bond beam grout shall not be mechanically vibrated. Grout shall be placed in

reinforced block cores, bond beams, lintels, and in other locations indicated on the Drawings. If the cells beneath a bond beam are not required to be grouted, wire mesh material may be used in the joint to retain the grout.

3.3 LAYING MASONRY UNITS.

- A. All masonry units shall be free from dust, dirt, and surface moisture when laid.
- B. All masonry shall be laid to a line. Walls shall be plumb and straight and in level courses. At no time shall any part of masonry construction project more than 8 feet [2.4 m] above adjacent work. When work is suspended, the tops of exterior masonry walls shall be covered and protected from the weather.
- C. Care shall be taken in corner construction and at jambs to maintain uniformity of appearance and to ensure that only whole, undamaged units are used. All patterned masonry units shall have special corner units installed at exposed corners to maintain consistency of patterns. Masonry units shall be selected and laid so that the exposed face of each unit is free of broken corners, chipped edges, or other defects which would be detrimental to the appearance of the wall surface.
- D. Units laid in stack bond or soldier coursing shall be carefully plumbed, so that vertical joints will form uniform, continuous vertical lines of uniform width, texture, and general appearance. Units shall be of uniform length and shall be trimmed as necessary. Facing brick in stack bond, patterns, or soldier coursing shall be selected to meet the dimensional tolerances and chippage limitations of ASTM C216 for Type FBX brick. Short closure pieces shall not be used in stack bond.
- E. Brick laid in running bond shall be so constructed that vertical joints in alternate courses lie in the same vertical lines, midway between the vertical joints in adjacent courses to provide a regular and uniform joint pattern. All custom scored units shall be aligned as detailed on the Drawings.
- F. Brick shall be saw-cut to provide openings and to accommodate embedded items. Anchors shall be securely embedded in mortar. Door and window frames shall be maintained plumb and true. Brick shall be built tightly against interior door frames. A caulking space shall be provided between exterior door frames and masonry in accordance with the details indicated on the Drawings. The jambs of built-in hollow metal door frames shall be completely filled with grout fill.
- G. Lintels shall be provided over all brick wall openings. Lintels shall be of the types and sizes indicated on the Drawings, and shall be acceptable to Architect.
- H. All embedded items shall be set and securely anchored in the masonry work as indicated on the Drawings or as acceptable to Architect. Joints between masonry and embedded items shall be pointed.
- I. Multi-wythe cavity walls shall be carefully constructed to the dimensions indicated on the Drawings. On the cavity face of facing brick and concrete block, all mortar extruded

from the joints shall be struck off flush with the masonry surface. The cavity shall be kept free of mortar droppings.

- J. Where indicated on the Drawings, rigid insulation shall be installed in the cavity between brick and CMU and in the cavity behind veneer facing cast-in-place concrete. The rigid insulation shall be installed in horizontal blocks sized to fit neatly between joint reinforcement, with joints butted as closely as possible. The insulation shall be secured to the face of the cast-in-place concrete or the backup masonry with mastic adhesive applied as recommended by the manufacturer and shall be kept from contact with the facing veneer.

3.4 THROUGH-WALL FLASHINGS.

- A. Through wall total flash flashing system shall be installed where and as indicated on the Drawings. Flashings in horizontal joints shall be in the bottom of the joints, and the stainless steel drip shall extend past the face of the wall unless otherwise indicated on the Drawings. Flashings shall drain toward the exterior surface of the wall. Lap joints shall be caulked and termination bars shall be screwed and caulked as per manufacturer's recommendations. The manufacturer's installation instructions shall be followed.
- B. Flashings over lintels and sills shall extend 8 inches past each jamb and shall have end dams. Joints in wall flashings shall overlap and shall be caulked as per manufacturer's recommendations.

3.5 EXPANSION AND CONTROL JOINTS.

- A. Expansion and control joints in masonry walls and veneer shall be constructed as indicated on the Drawings. Joint material shall be placed tightly in the wall as construction proceeds.
- B. Veneer joint filler strips shall have a thickness not less than the nominal width of the joint. The filler strips shall be firmly bonded to one joint face by the adhesive backing, and shall be of required width to be held back 1/2 inch [13 mm] from each face for caulking, and placed under compression by the abutting masonry. All joints in filler strips shall be tightly butted.

3.6 ANCHORS, INSERTS, AND OTHER PENETRATIONS.

- A. All necessary ties, anchors, bolts, inserts, bucks, flashings, sleeves for piping, conduits of every kind, window and door frames, and other work shall be accurately set and securely held in the masonry work as indicated on the Drawings or in a manner acceptable to Architect. Sleeves shall be provided where small piping passes through the masonry.

- B. Structural shapes, joists, and decking passing through or over the masonry, but not bearing on the masonry, shall be isolated from the masonry by a minimum of 1 inch [25 mm] on all sides, unless indicated otherwise on the Drawings.

3.7 LOW TEMPERATURES.

- A. When the temperature of the surrounding air is below 40°F [4°C], the cold weather construction procedures of TMS 602 shall be followed except as modified below.
 - 1. In addition to the weather protection specified for ordinary conditions, masonry materials shall also be kept from contact with snow, ice, or dampness of any kind.
 - 2. The temperature of the mixed mortar shall be between 70 and 120°F [21 and 49°C]. Mixing water shall be warm, but not above 165°F [74°C]. If necessary, sand shall be heated also. Mortar mixing equipment shall be heated before it is used. The use of salt or calcium chloride is not acceptable.
 - 3. Brick shall be above freezing when laid. If the outdoor temperature is below 30°F [-1°C], units shall be heated to at least 40°F [4°C]. If the temperature is below 0°F [-17°C], units shall be heated to at least 60°F [15°C]. Heating shall be done so that the units are not damaged.
 - 4. Brick shall be kept warm for at least 72 hours after laying. The air temperature at the masonry surface shall be kept between 45°F and 90°F [7°C and 32°C], using heating methods that will not unduly dry out or otherwise damage the masonry. Masonry surfaces inside enclosures shall not be exposed to carbon dioxide gases emitted from heaters. Heat shall be applied to both sides of the wall, with provisions for proper circulation of air. The masonry shall be suitably housed or covered.

3.8 HIGH TEMPERATURES.

- A. When the ambient air temperature exceeds 100°F [38°C], or exceeds 90°F [32°C] with a wind velocity greater than 8 mph [13 km/hr], the hot weather construction procedures of TMS 602 shall be followed.

3.9 FINISH TUCK POINTING.

- A. On completion of the work, all exposed masonry shall be pointed where necessary and all voids and holes in the mortar shall be filled to match adjacent joint surfaces. Defective joints shall be cut out and repointed with mortar. Care shall be taken to produce a uniform overall appearance. Spottiness due to variations in either materials or workmanship will not be acceptable.

3.10 PROTECTION FROM DAMAGE.

- A. Brick and all embedded or built-in items shall be carefully protected from damage. Masonry walls discolored by paint, mortar, or concrete shall be rebuilt with new materials.
- B. Where concrete is placed adjacent to or on top of previously constructed brick, the brick shall be adequately protected against damage and against splashing of concrete paste.

3.11 CLEANING.

- A. Following finish pointing, all exposed brick surfaces shall be cleaned to remove all surface stains and smears. If stains and smears cannot be removed by the specified methods, Contractor may propose alternative methods or cleaning products. These alternatives shall be acceptable to Architect before they are used.
- B. A detergent masonry cleaner shall be used to clean facing brick in accordance with the manufacturer's recommendations.

3.12 OWNER'S FIELD CONTROL TESTING.

- A. Field control tests will be performed by a testing laboratory. Contractor shall provide testing personnel with access to all material stockpiles and shall provide the services of one or more employees as necessary to assist with the collection of samples and construction of prisms. Contractor shall provide material samples in sufficient quantity to conduct the specified tests.
- B. As stipulated in the Quality Control section, tests required during the progress of work will be made at the expense of Owner.
- C. The frequency specified for each field control test is approximate and subject to change as determined by Architect.
- D. Grout. Grout will be field sampled during placement and will be tested once per 5,000 square feet [465 m²] of wall. Sampling and testing will be in accordance with ASTM C1019. Compressive strength tests shall be conducted at 28 days after sample collection. Grout strength shall equal or exceed the specified f'm.

End of Section

04511 - MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. WORK INCLUDES cleaning existing masonry surfaces where indicated on the Drawings, as specified herein.

1.2 PREINSTALLATION MEETINGS

- A. PREINSTALLATION CONFERENCE: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. PRODUCT DATA: For each type of product.

1.4 QUALITY ASSURANCE

- A. MOCKUPS: Prepare mockup of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. CLEANING: Clean an area of approximately 10 sq. ft. for each type of masonry and surface condition.
 - 2. TEST CLEANERS AND METHODS ON SAMPLES OF ADJACENT MATERIALS for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.
 - 3. ALLOW A WAITING PERIOD of not less than seven (7)-days after completion of sample cleaning to permit a study of sample panels for negative reactions.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. WATER: Potable.
 - 1. HOT WATER: Water heated to a temperature of 140- to 160-deg F.
- B. NONACIDIC LIQUID CLEANER: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.
 - 1. MANUFACTURERS: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

American Building Restoration Products, Inc.

Cathedral Stone Products, Inc.

Diedrich Technologies, Inc.; a Hohmann & Barnard company.

Dumond Chemicals, Inc.

Hydroclean; Hydrochemical Techniques, Inc.

Price Research, Ltd.

PROSOCO, Inc.

PART 3 - EXECUTION

A. PROTECTION

1. COMPLY WITH cleaning product manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products.
 - a. Prevent chemical cleaning solutions from coming into contact with people, and other surfaces that could be harmed by such contact.
 - b. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces.
 - c. Apply masking agents according to manufacturer's written instructions.
 - d. When no longer needed, promptly remove masking to prevent adhesive staining.

3.2 CLEANING MASONRY, GENERAL

- A. CLEANING APPEARANCE STANDARD: Cleaned surfaces are to have a uniform appearance.
- B. PROCEED WITH CLEANING in an orderly manner. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
 1. USE ONLY THOSE CLEANING METHODS indicated for each masonry material and location.
 - a. BRUSHES: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
 2. SPRAY EQUIPMENT: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.
 - a. Equip units with pressure gages.
 - b. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.
 3. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.

4. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- C. PERFORM CLEANING in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.
1. PERFORM ADDITIONAL GENERAL CLEANING, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed, so that cleaned surfaces blend smoothly into surrounding areas.
- D. CHEMICAL-CLEANER APPLICATION METHODS: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; using brush or spray application as appropriate. Do not spray apply at pressures exceeding 50-PSI. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
1. RINSE OFF CHEMICAL RESIDUE and soil by working upward from bottom to top of each treated area. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
 2. APPLY NEUTRALIZING AGENT and repeat rinse if necessary, to produce tested pH of between 6.7 and 7.5.

3.3 PRELIMINARY CLEANING

- A. Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, plastic anchors, calking, asphalt, and tar.
- B. Remove existing paint and calking / sealant materials with alkaline paint remover, if necessary.

3.4 CLEANING MASONRY

- A. NONACIDIC LIQUID CHEMICAL CLEANING:
1. Wet surface with hot water applied by low-pressure spray.
 2. Apply cleaner to surface in two applications by brush or low-pressure spray.
 3. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer.
 4. Rinse with water applied by low-pressure spray to remove chemicals and soil.
 5. Repeat cleaning procedure above where required to produce required cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

End of Section

PART 1 - GENERAL

1-1. SCOPE. This section covers the design and installation of anchors in concrete and masonry. It includes adhesive anchors for both threaded rods and reinforcing bars, expansion anchors, screw anchors, and undercut anchors.

1-2. GENERAL

1-2.01. Anchors Designed by Engineer. Post-installed anchors that are fully detailed on the Drawings have been designed by Engineer, unless noted otherwise.

Post-installed anchors identified on the Drawings as a specific manufacturer and product shall not be changed to a different post-installed manufacturer or product without approval of Engineer.

Post-installed anchors identified on the Drawings as a specific anchor type, but indicating no specific product, may use any of the listed products of that anchor type.

Contractor shall reimburse Engineer, through Owner, for Engineer's design costs related to evaluating alternative anchor types, products, or details.

1-2.02. Anchors Designed by Contractor or Contractor's Suppliers.

Anchors shall be designed for loads due to all operating conditions, plus relevant snow, wind, and seismic loadings.

Seismic anchorage design for non-structural components shall include the overstrength factors indicated in ASCE 7, Tables 13.5-1 and 13.6-1, when applicable.

Design of anchorage into concrete shall be in accordance with ACI 318 Chapter 17, shall consider concrete to be cracked, and shall not include the strengthening effects of supplementary reinforcement or anchor reinforcement unless approved by Engineer.

Design of anchorage into masonry shall be in accordance with TMS 402.

Post installed anchors shall be designed in accordance with the anchor manufacturer's research report, and shall consider the applicable effects of anchor spacing, edge distances, embedment depths, and temperature.

Anchorage calculations performed by Contractor's suppliers shall utilize design tools applicable to the specific anchorage products intended to be used by Contractor.

1-2.03. Materials. Unless otherwise indicated, anchors of structural steel members connected to concrete shall have a diameter of at least 3/4 inch, and structural members connected to masonry shall have a diameter of at least 5/8 inch. Anchors for ladders and equipment shall have a diameter of at least 1/2 inch. Anchors for pedestrian railing systems shall have a diameter of at least 3/8 inch.

Unless otherwise indicated on the Drawings, anchors used in the following locations and applications shall be of the indicated materials.

Adhesive, Expansion, Screw, and Undercut Anchors

Submerged locations	Stainless steel.
Locations subject to splashing	Stainless steel.
Buried locations	Stainless steel.
Anchorage of structural steel columns	Stainless steel.
Other exterior locations	Stainless steel.
Interior locations not subject to corrosion	Carbon steel.

1-3. SUBMITTALS. All submittals shall be made in accordance with the Submittal Procedures section.

The following items shall be submitted, as a minimum.

Manufacturer's information for all products supplied under this section, in the form of manufacturer's research reports (from independent organizations such as ICC-ES or IAPMO UES), technical data sheets, and certificates of compliance.

Shop drawings for anchor bolts, anchor rods, and post-installed anchors, including anchor manufacturer, products, and embedment depth. Shop drawings for anchors designed by Contractor's suppliers shall be sealed by a professional engineer licensed in the state of the project.

Anchorage calculations performed by Contractor's suppliers.
Calculations shall be prepared and sealed by a professional engineer licensed in the state of the project.

1-4. DELIVERY, STORAGE, AND HANDLING. Materials shall be handled, transported, and delivered in a manner which will prevent damage or corrosion. Damaged materials shall be promptly replaced. Materials shall be shipped and stored in original manufacturer's packaging.

PART 2 - PRODUCTS

2-1. MATERIALS. Unless otherwise indicated on the drawings, materials shall be as indicated below.

Expansion Anchors in Concrete	Products shall be single component anchors tested in accordance with ICC AC193 and shall have a manufacturer's research report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces.
Carbon Steel	Hilti "Kwik-Bolt TZ2", Simpson "Strong-Bolt 2", or DeWalt "Power-Stud+SD2".
Stainless Steel	Hilti "Kwik-Bolt TZ2 SS304", Hilti "Kwik-Bolt TZ2 SS316", Simpson "Strong-Bolt 2", DeWalt "Power-Stud+SD4", or DeWalt "Power-Stud+SD6".
Screw Anchors in Concrete	Products shall be single component anchors tested in accordance with ICC AC193 and shall have a manufacturer's research report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces.
Carbon Steel	Hilti "KH-EZ", Simpson "Titen HD", or DeWalt "Screw-Bolt+".
Stainless Steel	Hilti "KH-EZ".

Undercut Anchors in Concrete	Products shall be tested in accordance with ICC AC193 and shall have a manufacturer’s research report in compliance with the applicable building code.
Carbon Steel	Hilti “HDA Undercut Anchor”, Simpson “TCA Undercut Anchor”, or DeWalt “CCU+ Undercut Anchor”.
Stainless Steel	Hilti “HDA-R Undercut Anchor”.
Adhesive Anchors in Concrete	Products shall be tested in accordance with ICC AC308 and shall have a manufacturer’s research report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces.
Threaded Rods and Nuts (Carbon Steel)	ASTM A307 or ASTM F1554 Grade 36.
Threaded Rods and Nuts (Stainless Steel)	ASTM F593, CW.
Reinforcing Bars	ASTM A615, Grade 60, deformed.
Reinforcing Bars, weldable	ASTM A706, Grade 60, deformed.
Adhesive (Epoxy)	Hilti “HIT-RE 500 V3”, Simpson “SET-3G”, or DeWalt “Pure 110+”.
Adhesive (Acrylic)	Hilti “HIT-HY 200 V3”, Simpson “AT-XP”, or DeWalt “AC200+”.
Expansion Anchors in Grouted Concrete Masonry Units	Products shall be single component anchors tested in accordance with ICC AC01 and shall have a manufacturer’s research report in compliance with the applicable building code. Hilti “Kwik-Bolt TZ2 Masonry Anchors”, Simpson “Wedge-All”, or DeWalt “Power-Stud+SD1”.

Adhesive Anchors in Grouted Concrete Masonry Units	Products shall be tested in accordance with ICC AC58, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts (Carbon Steel)	ASTM A307 or ASTM F1554 Grade 36.
Threaded Rods and Nuts (Stainless Steel)	ASTM F593 CW (Hilti or DeWalt systems), or ASTM A193 Grades B6, B8, or B8M (for Simpson system).
Adhesive	Hilti "HIT-HY 270", DeWalt "AC100+ Gold", or Simpson "SET XP".
Adhesive Anchors in Hollow Concrete Masonry Units	Products shall be tested in accordance with ICC AC58, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts (Carbon Steel)	ASTM A307 or ASTM F1554 Grade 36.
Threaded Rods and Nuts (Stainless Steel)	ASTM F593 CW (Hilti or DeWalt systems), or ASTM A193 Grades B6, B8, or B8M (for Simpson system).
Adhesive	Hilti "HIT-HY 270", DeWalt "AC100+ Gold", or Simpson "SET XP".
Screen Tubes	As recommended by the manufacturer.
Adhesive Anchors in Unreinforced Brick Masonry	Products shall be tested in accordance with ICC AC60, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts	ASTM A307.
Adhesive	Hilti "HIT-HY 270", DeWalt "AC100+ Gold", or Simpson "ET-HP".
Screen Tubes	As recommended by the manufacturer.

2-2. ANCHORS.

2-2.01. Adhesive, Expansion, Screw, and Undercut Anchors. Unless otherwise noted, single nuts and washers shall be provided with adhesive anchors, expansion anchors, screw anchors, and undercut anchors. Adhesive anchors shall be free of coatings that would weaken the bond with the adhesive.

Adhesive anchors in hollow CMU masonry and unreinforced brick masonry shall utilize screen tubes as recommended by the manufacturer.

PART 3 - EXECUTION

3-1. GENERAL. Anti-seize thread lubricant shall be liberally applied to projecting, threaded portions of stainless steel anchors immediately before tightening of the nuts.

3-1.01. Compliance With Manufacturer's Instructions. Post-installed anchors shall be installed in accordance with the manufacturer's printed installation instructions and all applicable requirements of the manufacturer's research report for the specific anchor system. If conflicts are found between the Drawings, the manufacturer's printed installation instructions, and the manufacturer's research report installation requirements, Contractor shall notify Engineer for resolution.

3-2. ADHESIVE ANCHORS. Adhesive shall be statically mixed in the field during application. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.

Anchors or bars shall be installed in holes hammer drilled into hardened concrete or masonry. Drill shall be set to rotation-only mode when drilling into hollow CMU or into brick. Diameter of holes shall be 1/16 inch larger than the outside diameter of the rod or bar unless recommended otherwise by the anchor system manufacturer. Holes shall be prepared by removing all dust and debris using procedures recommended by the adhesive manufacturer.

Adhesive anchors and holes shall be clean, dry, and free of grease and other foreign matter at the time of installation. The adhesive shall be placed and the rods or bars shall be set in accordance with the recommendations of the manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with adhesive, without voids.

3-2.01. Concrete Installation. Unless indicated otherwise on the Drawings, reinforcing bars shall be embedded to a depth of 15 bar diameters, and threaded rods shall be embedded to a depth that will develop the yield strength of the rod.

Adhesive anchors in concrete shall be installed under the following conditions.

Minimum Age of Concrete Prior to Anchor Installation	21 days.
Concrete Temperature Range	Maximum short-term temperature 162 F, maximum long-term temperature 110 F.
Moisture Condition	Dry concrete.
Type of Lightweight Concrete	N/A
Hole Drilling and Preparation	Hammer drill only.

Installation of adhesive anchors into concrete that are either horizontal or upwardly inclined shall be performed only by personnel certified by the ACI/CRSI Adhesive Anchor Installation Certification Program.

3-2.02. Masonry Installation. Anchors shall be installed to meet all criteria in the manufacturer's installation instructions and ICC-ES reports, including but not limited to minimum compressive strength at time of installation, minimum edge distances, minimum clearances from mortar joints, minimum anchor spacing, and use of screen tubes.

3-3. EXPANSION, SCREW, AND UNDERCUT ANCHORS. Expansion, screw, and undercut anchors shall be installed using all procedures and accessory devices recommended by the anchor manufacturer.

End of Section

06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SCOPE

- A. PROVIDE NAILERS, blocking, backing, and plywood as required for completion of the Work, where noted on the Drawings, and as specified herein.
 - 1. Interior rough carpentry must be fire-retardant treated (FRT)
 - 2. Roof nailers to be pressure treated

1.2 DEFINITIONS

- A. ROUGH CARPENTRY: Carpentry Work not specified as part of other Sections, and which is generally not exposed.
- B. BOARDS OR STRIPS: Lumber of less than 2-inches nominal size in least dimension.
- C. DIMENSION LUMBER: Lumber of 2-inches nominal size or greater but less than 5-inches nominal size in least dimension.

1.3 ACTION SUBMITTALS

- A. PRODUCT DATA: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. MATERIAL CERTIFICATES: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. EVALUATION REPORTS: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. STORE ROUGH CARPENTRY UNITS flat with spacers beneath and between each bundle to provide air circulation. Protect from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER STANDARD:

- A. DOC PS 20 and applicable rules of grading agencies indicated, or if no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
 - 3. Maximum Moisture Content of Lumber: 15 percent.

2.2 WOOD BLOCKING & PANELS

- A. FOR SUPPORT OR ATTACHMENT OF OTHER CONSTRUCTION, including, roof blocking, nailers, and for concealed wall blocking: provide minimum 2x6 nominal (3-1/2 by 5-1/2-inch actual) dimension lumber of Construction, Stud, or No. 2 grade with 19 percent maximum moisture content.
- B. ELECTRICAL / PHONE PANELS: DOC PS 1, APA B-C Plugged, Exposure 1, fire-retardant treated plywood, minimum 3/4-inch-thick by 24-inch-wide by 48-inch-high minimum or as otherwise indicated on the Drawings.

2.3 WOOD-PRESERVATIVE-TREATED (TRT) MATERIALS

- A. PRESERVATIVE TREATMENT BY PRESSURE PROCESS: Comply with AWPA U1, and as follows:
 - 1. For interior construction not in contact with the ground: Use Category UC2
 - 2. For exterior construction not in contact with the ground: Use Category UC3b
 - 3. For items in direct contact with the ground: Use Category UC4a
- B. PRESERVATIVE CHEMICALS: Provide materials acceptable to AHJ and containing no arsenic or chromium.
- C. KILN-DRY after treatment to maximum moisture content of 15-percent.
- D. TREAT ITEMS INDICATED on Drawings, and the following:
 - 1. Wood nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE RETARDANT TREATED (FRT) WOOD MATERIALS

- A. AT INTERIOR WOOD BLOCKING, use materials complying with requirements in this article, that are acceptable to the AHJ, and with fire-test-response characteristics as determined by testing identical products by a qualified testing agency.
- B. FRT LUMBER AND PLYWOOD BY PRESSURE PROCESS: Products with a flame-spread index of 25 or less when tested per ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5-feet beyond the centerline of the burners at any time during the test.
 - 1. INTERIOR TYPE A: Treated materials must have a moisture content of 28-percent or less when tested per ASTM D3201 at 92-percent relative humidity.
- C. KILN-DRY after treatment to maximum moisture content of 15-percent.
- D. IDENTIFY FIRE-RETARDANT TREATED WOOD with appropriate classification marking of qualified testing agency.

2.5 FASTENERS

- A. PROVIDE FASTENERS OF SIZE AND TYPE that comply with requirements specified in this Article for material and manufacture:
 - 1. Nails, Brads, and Staples: ASTM F1667.
 - 2. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to AHJ, based on ICC-ES AC70.

3. Wood Screws: ASME B18.6.1.
 4. Screws for Fastening to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 5. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).
 6. Bolts: Steel bolts complying with ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with ASTM A563 hex nuts and, where indicated, flat washers.
- B. POST-INSTALLED ANCHORS: Fastener systems with an evaluation report acceptable to AHJ, based on ICC-ES AC01 for mechanical anchors in masonry substrate, or ICC-ES AC58 for adhesive anchors in masonry substrate, or ICC-ES AC193 for mechanical anchors in concrete substrate, or ICC-ES AC308 for adhesive anchors in concrete substrate, as applicable.
1. Provide expansion-type units consisting of an anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in masonry, or equal to 4 times the load imposed when installed into concrete substrates as determined by testing per ASTM E488 conducted by a qualified independent testing and inspecting agency.
 2. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
- C. WHERE ROUGH CARPENTRY IS EXPOSED TO WEATHER, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. SET ROUGH CARPENTRY to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. INSTALL BLOCKING AND BACKING PANELS by secure anchorage to substrate materials; coordinate locations with requirements of items to be wall-supported and with utilities requiring backing panels. Install FRT plywood backing panels with classification marking of testing agency exposed to view.
- C. SORT AND SELECT LUMBER so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- D. COMPLY WITH AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.
- E. SECURELY ATTACH ROUGH CARPENTRY WORK to substrate by anchoring and fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 2. ICC-ES evaluation report for fastener.
 3. Use screws unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION:

- A. INSTALL WHERE INDICATED and where required for attaching other Work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other Work involved.
- B. ATTACH ITEMS TO SUBSTRATES to support applied loading.
- C. RECESS BOLTS AND NUTS FLUSH with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.
- D. PROVIDE PERMANENT GROUNDS of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2-inches-wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD BLOCKING AT ROOF AREAS:

- A. PROVIDE NOT LESS THAN 2 by 6-inch nominal preservative treated wood blocking members at roof and roof edges – spaced when necessary with solid shims or plywood, as appropriate. Connect blocking members in accordance with FM Global's Property Loss Prevention Data Sheet # 1-49 – "Perimeter flashing", and as follows:
 1. BLOCKING TO OTHER BLOCKING: Provide galvanized wood screws with minimum 100-pound withdrawal resistance or lag screws of equivalent strength, in length to penetrate into secured member not less than 1-1/4-inch. Install fasteners in two (2) rows staggered, with spacing in each row not to exceed 24-inches typically, and at 12-inch centers when within eight (8) feet (or 10% of total wall length - whichever is greater) of intersection with other walls.

3.4 PROTECTION

- A. PROTECT WOOD THAT HAS BEEN TREATED with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. PROTECT ROUGH CARPENTRY from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

End of Section

07015 - EXISTING ROOF CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SCOPE

- A. CUT AND PATCH existing roofing as required by installation of new equipment.
- B. ENGAGE A ROOFING ENTITY for the Work of this Section that is approved for use by the original, existing roofing system manufacturer, to maintain the Owner's existing roof Warranty.

1.2 RELATED SECTIONS:

- A. DIVISION-01 "TEMPORARY FACILITIES AND CONTROLS" Section for temporary construction and environmental-protection measures for reroofing preparation.
- B. DIVISION-01 "CUTTING AND PATCHING" Section for general cutting and patching requirements.
- C. DIVISION-06 "ROUGH CARPENTRY" Section for wood nailers, cants, curbs, and blocking required.
- D. DIVISION-07 "SHEET METAL FLASHING AND TRIM" Section for metal flashings, and counterflashings required.
- E. APPLICABLE DIVISION-15 SECTIONS for new HVAC equipment.
- F. APPLICABLE DIVISION-16 SECTIONS for electrical equipment disconnection and reconnection, if applicable.

1.3 MATERIALS OWNERSHIP:

- A. DEMOLISHED MATERIALS must be removed from Project site.

1.4 SUBMITTALS

- A. PRODUCT DATA: For each type of product to be installed.
- B. MATERIALS: Include Product Data and description of new membrane and membrane flashing materials required for roof cutting and patching Work required.

1.5 QUALITY ASSURANCE

- A. **REGULATORY REQUIREMENTS:** Comply with governing EPA notification regulations before beginning membrane roofing cutting and patching. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PRE-CONSTRUCTION CONFERENCE:

- A. **CONDUCT CONFERENCE** at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to cutting and patching of the existing roofing system, including but not limited to, the following:
 - 1. Meet with Contractor's superintendent, foreman; and installers whose work interfaces with or affects cutting and patching of the existing roof, including installers of roof-mounted equipment.
 - 2. Review methods and procedures related to roofing cutting and patching preparation, including the existing roofing system manufacturer's written instructions.
 - 3. Review temporary protection requirements for existing roofing system that is to remain, during and after installation.
 - 4. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 5. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect roof cutting and patching.
 - 6. Review existing conditions that may require notification of Owner before proceeding.

1.7 PROJECT CONDITIONS

- A. **THE OWNER WILL OCCUPY** the existing building immediately below roof cutting and patching areas. Conduct the Work so that the Owner's operations will not be disrupted.
 - 1. Provide Owner with not less than 72-hours' notice of activities that may affect Owner's operations.
- B. **PROVIDE PROTECTIVE** dust or water leakage covers over sensitive equipment, shut down HVAC equipment if needed, and evacuate occupants from below the work area, when necessary.
- C. **EVACUATE OCCUPANTS** from below structurally impaired areas of existing roof deck. Verify that occupants below the work area have been evacuated prior to proceeding with work over the impaired deck area.
- D. **PROTECT THE EXISTING BUILDING**, adjacent building areas, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roofing

operations. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Owner assumes no responsibility for condition of areas to be cut and patched.

1. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
2. Limit construction loads on the roof to comply with the allowable, uniform distributed structural live-load capacity of the existing roof structural system.

1.8 WEATHER LIMITATIONS:

- A. Proceed with roof cutting and patching operations only when existing and forecasted weather conditions permit Work to proceed without the risk of water entering into existing roofing system or building.

1.9 HAZARDOUS MATERIALS:

- A. It is not anticipated that hazardous materials such as asbestos-containing materials will be encountered in the Work. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 ROOF CUTTING AND PATCHING MATERIALS:

- A. PROVIDE NEW MATERIALS including roofing membrane, insulation, blocking, membrane flashing, sealers, and other related materials as required by the manufacturer of the existing roofing system, as necessary to maintain the existing Roofing System Warranty.

PART 3 - EXECUTION

3.1 PREPARATION

- A. PROTECT ADJACENT EXISTING MEMBRANE ROOFING SYSTEM that is not to be cut or patched.
 1. Loosely lay 1-inch- minimum thick, molded expanded polystyrene (MEPS) insulation over the roofing membrane in areas indicated, minimum ten (10) feet beyond area of new roofing.
 2. Loosely lay 15/32-inch plywood or OSB panels over MEPS. Extend MEPS past edges of plywood or OSB panels a minimum of 1 inch.
- B. LIMIT TRAFFIC AND MATERIAL STORAGE to areas of existing roofing membrane that have been protected.

1. Maintain temporary protection and leave in place until replacement roofing has been completed.
- C. COORDINATE WITH OWNER TO SHUT DOWN AIR INTAKE equipment in the vicinity of the Work. Cover air intake louvers before proceeding with roofing cutting and patching Work that could affect indoor air quality or activate smoke detectors in the ductwork.
- D. PROVIDE SUFFICIENT AND SUITABLE MATERIALS ON-SITE to facilitate rapid installation of temporary protection in the event of unexpected rain, during cutting and patching operations.
- E. MAINTAIN EXISTING ROOF DRAINAGE in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof scuppers and conductors. Use drain plugs specifically designed for this purpose. Remove plugs at end of each workday, when no work is taking place, or when rain is forecast. If scuppers will be temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.
- F. COMPLETE TERMINATIONS AND BASE FLASHINGS and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- G. TIE-INS TO EXISTING ROOFING: Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty of existing membrane roofing system, if exists.
- H. VERIFY THAT ROOFTOP UTILITIES and service piping have been shut off before commencing Work.

3.2 ROOF CUTTING AND PATCHING

- A. NOTIFY OWNER each day of extent of roof cutting and patching Work proposed and obtain authorization to proceed.
- B. ROOF TEAR-OFF: Remove existing roofing membrane and immediately check for presence of moisture by visually observing existing materials intended to remain.
- C. SPOT-CHECK ROOFING MATERIALS intended to remain with a thermal imaging camera.
- D. REMOVE wet or damp materials.

3.3 EXISTING CONCRETE ROOF DECK INSPECTION

- A. INSPECT EXISTING ROOF DECK after removal of existing membrane roofing system.

1. IF INTEGRITY OF EXISTING ROOF DECK IS SUSPECT, immediately notify Architect. Do not proceed with cutting and patching until so directed.

3.4 ROOF CUTTING AND PATCHING

- A. Cut EXISTING ROOFING, insulation and decking as required for installation of new rooftop mounted equipment, as indicated on the Drawings.
- B. INSTALL MEMBRANE FLASHINGS, SHEET FLASHINGS AND PREFORMED FLASHING ACCESSORIES and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- C. APPLY SOLVENT-BASED BONDING ADHESIVE to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- D. FLASH PENETRATIONS and field-formed inside and outside corners with sheet flashing.
- E. CLEAN MEMBRANE SEAM AREAS AND OVERLAP and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- F. TERMINATE AND SEAL TOP OF SHEET FLASHINGS and mechanically anchor to substrate through termination bars.

3.5 FIELD QUALITY CONTROL

- A. OWNER'S TESTING: Owner reserves the right to engage a separate, qualified independent testing and roof inspecting entity to review test reports and to perform separate, roof tests and inspections.
- B. MANUFACTURER'S FINAL ROOF INSPECTION: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
- C. REPAIR OR REMOVE AND REPLACE new Work that do not comply with specified requirements. Additional testing and inspecting, at Contractor's expense, must be performed to determine compliance of replaced or additional work with specified requirements.

3.6 PROTECTING AND CLEANING

- A. PROTECT MEMBRANE ROOFING SYSTEM from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. CORRECT DEFICIENCIES in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition

free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

3.7 DISPOSAL

- A. COLLECT AND PLACE DEMOLISHED MATERIALS in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. Storage or sale of demolished items or materials on-site will not be permitted.
- B. TRANSPORT DEMOLISHED MATERIALS off Owner's property and legally dispose of them.

End of Section

07213 - BATT, BLANKET AND ACOUSTIC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. **WORK INCLUDED:** Provide batt and blanket insulation, as shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

1.2 ACTION SUBMITTALS

- A. **SUBMIT PRODUCT DATA** with installation instructions for each type of insulation, moisture protection material, and related accessories required, including fasteners and anchors.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. **PROTECT INSULATION MATERIALS** from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS - GENERAL

- A. **THERMAL CONDUCTIVITY:** Thicknesses indicated are for thermal conductivity (k-value at 75 degrees F or 24 degrees C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide thickness required to achieve indicated value.
- B. **FIRE AND INSURANCE RATINGS:** Comply with fire-resistance, flammability and insurance ratings indicated.

2.2 MANUFACTURERS

- A. **SINGLE SOURCE OF INSULATION PRODUCTS:** Obtain each type of insulation from a single source with resources to provide products of consistent quality and physical properties, without delaying Work progress.
- B. **SIZE / THICKNESS:** Provide materials in thickness indicated, in maximum sizes to minimize joints.

C. AVAILABLE MANUFACTURERS: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. CertainTeed Corporation
2. Johns Manville, a Berkshire Hathaway company
3. Knauf Insulation
4. Owens Corning / Thermafiber
5. Rockwool North America

2.3 MINERAL / GLASS FIBER BATT / BLANKET INSULATION

A. CLASS-A FACED BATT INSULATION: Formaldehyde free fiberglass or rock-wool faced batts or blankets with a polypropylene-scrim-kraft-facing, meeting ASTM C665, Type II (nonreflective faced, Class A (faced surface with a flame spread index of 25 or less); Category 1 (membrane is a vapor barrier).

1. Provide identification mark indicating R-value of each piece of insulation 12-inches and wider in width.

B. ACOUSTICAL INSULATION: formaldehyde free fiberglass or rock-wool un-faced batts or blankets (without facings), meeting ASTM C665, Type I (blankets without membrane facing) with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.4 ACCESSORIES

A. LOOSE-FILL INSULATION: Glass-fiber insulation meeting ASTM C764, Type II, with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.

PART 3 - EXECUTION

A. EXAMINATION

1. EXAMINE SUBSTRATES AND CONDITIONS, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. CLEAN SUBSTRATES OF SUBSTANCES harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. COMPLY WITH INSULATION MANUFACTURER'S WRITTEN INSTRUCTIONS applicable to products and application indicated. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- B. INSTALL INSULATION WITH MANUFACTURER'S R-VALUE LABEL exposed after insulation is installed.
- C. EXTEND INSULATION IN THICKNESS INDICATED to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. APPLY SINGLE LAYER OF INSULATION to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. BATT, BLANKET and ACOUSTICAL INSULATION: Install in cavities formed by framing members according to the following requirements:
 - 1. USE INSULATION WIDTHS AND LENGTHS that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. PLACE INSULATION IN CAVITIES formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. FOR METAL-FRAMED WALL CAVITIES where cavity heights exceed 96-inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. MISCELLANEOUS VOIDS: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
- C. LOOSE-FILL INSULATION: Apply according to ASTM C1015 and manufacturer's written instructions.
 - 1. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

3.5 PROTECTION

- A. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

End of Section

SECTION 07420 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foamed-filled insulated metal wall panels.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Sustainable Design Submittals:

1. Product data indicating recycled content of materials.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- D. Samples for Initial Selection: For each type of metal panel indicated with factory- applied color finishes.
1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.
1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency. C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical metal panel assembly, including corner, soffits, supports, attachments, and accessories.
 2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Acceptance Testing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leak-proof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 2. Warranty Period: 35 years from date of Substantial Completion.

- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 35 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E72:
 - 1. Wind Loads: As required by design code for Kansas City, MO.
 - 2. Other Design Loads: As required by code for Kansas City, MO.
 - 3. Deflection Limits: For wind loads, no greater than 1/180
- C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbft/sq. ft. (300 Pa).
- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbft/sq. ft. (300 Pa).
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67deg C), ambient; 180deg F (100 deg C), material surfaces.
- F. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E119.
2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E84.

2.2 FOAM-FILLED INSULATED METAL WALL PANELS

- A. General: Provide factory-formed and assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in-place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.
 1. Basis of Design: TrueCore Mesa (embossed).
 2. Insulation Core: Modified isocyanurate foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
 - a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.
 - b. Density: 2.0 to 2.6 lb./cu. ft. (32 to 42 kg/cu. m) when tested according to ASTM D1622.
 - c. Compressive Strength: Minimum 22 psi (151 kPa) when tested according to ASTM D1621.
 - d. Shear Strength: 36psi (248kPa) when tested according to ASTM C273/C273M.
- B. Concealed-Fastener style Foam-filled insulated metal wall panels: Formed with tongue- and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. TrueCore
 - b. Kingspan
 - c. MBCI
 - d. Metl-Span.
 2. Metallic-Coated Steel Sheet: Exterior and interior facings of G-90 galvanized coated steel conforming to ASTM A 653 or AZ-50 aluminum-zinc alloy coated steel, conforming to ASTM A 792/A 792M, minimum grade 33, pre-painted by the coil-coating process per ASTM A 755/A 755M.

- a. Nominal exterior and interior skin thickness: 24 gauge
- b. Exterior Finish: Two-coat fluoropolymer.
 - 1) Color: As indicated by Architect from manufacture's full range of colors.
- c. Interior Finish: Factory applied plastisol coating.
 - 1) Color: As indicated by Architect from manufacture's full range of colors.
- 3. Snap-on Batten: Same material, finish, and color as exterior facings of wall panels.
- 4. Panel Coverage: 30 inches nominal.
- 5. Panel Thickness: 3 inches (64 mm).
- 6. Thermal-Resistance Value (R-Value): 24 according to ASTM C1363.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, non-staining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. The pre-engineered metal building (PEMB) is being installed over a wet well that produces strong H₂S (hydrogen sulfide) gases that corrode ferrous metals. With that being the case, all ferrous metals associated with the insulated metal wall panels, including cut edges and hidden surfaces, will have a high performance coating applied to all surfaces of the metal prior to installation.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Color selection to be done by the architect from the manufacturer's full range of standard colors.
- E. Steel Panels and Accessories:
 - 1. Exterior Skin: Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, meeting solar reflectance index requirements. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Interior Skin: Fluoropolymer Two-Coat System: 0.2-mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat.
 - 3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light- colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
 - 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- A. Fasteners:
 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.
 1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 FOAM-FILLED INSULATED METAL WALL PANELS INSTALLATION

- A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.
 - 1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
 - 2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 - 3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
 - 4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 - 5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
 - 6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
 - 7. Apply snap-on battens to exposed-fastener, insulated-core metal wall panel seams to conceal fasteners.

- B. Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.
 - 1. Install clips to supports with self-tapping fasteners.

- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.
 - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- D. Metal wall panels will be considered defective if they do not pass test and inspections.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

07900 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SCOPE

- A. PROVIDE joint sealants where indicated and complying with requirements included herein, to establish and maintain airtight, vermin proof, and waterproof continuous seals on a permanent basis.
 - 1. Failures of installed sealants to comply with this requirement will be recognized as failures of materials or workmanship.
- B. TYPES OF APPLICATIONS include the following:
 - 1. EXTERIOR JOINTS in the following vertical or horizontal surfaces:
 - a. Pavement control and expansion joints
 - b. Joints between different materials
 - c. Control and expansion joints in various wall surfacing or cladding materials
 - d. Perimeter joints between wall surfaces and frames of doors, windows, louvers and other openings or penetrations
 - 2. INTERIOR JOINTS in the following vertical or horizontal surfaces:
 - a. Exposed control and expansion joints in concrete slabs
 - b. Control and expansion joints at exposed interior surfaces of exterior walls.
 - c. Exposed perimeter joints of exterior openings.
 - d. Control joints on exposed surfaces and frames of interior doors and windows.
 - e. Perimeter joints between interior wall surfaces and frames of exterior and interior doors and louver frames.
 - f. Perimeter joints between different products, materials or surfaces.
 - 3. FIRE RATED PENETRATIONS
 - a. Rated wall penetrations.
 - b. Rated floor/ ceiling penetrations.

1.2 ACTION SUBMITTALS

- A. PRODUCT DATA: For each joint-sealant product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. MANUFACTURER'S CERTIFICATES indicating that products comply with specification requirements are suitable for the uses indicated.

- B. MANUFACTURER’S COMPATIBILITY AND ADHESION TEST REPORTS from sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealant material. Include sealant manufacturer’s interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- C. SAMPLE WARRANTIES: For special warranties.

1.4 DELIVERY, STORAGE AND HANDLING

- A. DELIVER MATERIALS to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. STORE AND HANDLE MATERIALS per manufacturers’ recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminates, or other causes.

1.5 FIELD CONDITIONS

- A. DO NOT PROCEED WITH INSTALLATION of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. When contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

- A. SPECIAL INSTALLER'S WARRANTY: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. SPECIAL MANUFACTURER'S WARRANTY: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five (5)-years from date of Substantial Completion.

- C. SPECIAL WARRANTIES specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. AVAILABLE MANUFACTURERS / PRODUCTS: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the named products listed in this Section.
- B. COMPATIBILITY: Provide joint sealants, backings, and other related materials that are compatible with one another, and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- C. SEALANT COLORS: Match adjacent material color typically, as selected by the Architect.
1. The quantity of sealant colors is limited only by the number and color of adjacent materials indicated in the Drawings
 2. Provide custom colors to match adjacent materials at no additional cost if manufacturer's "standard" colors do not match adjacent materials, in the professional opinion of the Architect
 3. Provide multiple-colors of sealant as required by field-conditions when adjacent materials and their colors change throughout the height or width of a sealant joint
- D. VOC CONTENT OF INTERIOR SEALANTS: Sealants and sealant primers used inside the weatherproofing system must comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.

2.2 ELASTOMERIC JOINT SEALANTS

- A. **ELASTOMERIC SEALANTS:** Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. **STAIN-TEST-RESPONSE CHARACTERISTICS:** Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.
- C. **TRAFFIC-JOINT SEALANT:** ASTM C920 Type S (single component), grade P (pourable), class 25, use T (traffic), in colors selected by Architect from manufacturer's full range of available options. Provide primer for 100% adhesion between surface materials and sealant. Clear joints to minimum depth of 1/2-inch. Available Products include but are not limited to the following:
1. One-Part Self-Leveling Silicone Joint Sealants:
 - a. "Pecora 300 SL" by Pecora Corporation
 - b. "Spectrem 900 SL", by Tremco Corporation, or approved equal
 2. Two-Part Self Leveling Polyurethane Sealants:
 - a. "Urexpam NR-200, by Pecora Corporation
 - b. "Vulkem 245", by Tremco Corporation, or approved equal
- D. **EXTERIOR SILICONE SEALANT (typical exterior building sealant):** Ultra-low-modulus sealant per ASTM C920 Type S (single component), grade NS (nonsag), class 100/50, Use NT (nontraffic) and use related to joint substrates of M, G, A, and, as applicable to joint substrates indicated, O.
1. Available Products include:
 - a. "790 Silicone Building Sealant", by Dow Corning.
 - b. "SCS2700 SilPruf LM Sealant", by GE Silicones.
 - c. "890NST" by Pecora Corporation;
 - d. "Sikasil WS-290" by Sika Corporation, Construction Products Division.
 - e. "Spectrem 1" by Tremco Incorporated.
- E. **EXTERIOR BUTYL-RUBBER SEALANT (use at door thresholds):** Comply with ASTM C1085.
1. Available Products include:
 - a. "Chem-Calk 300 Butyl Rubber Sealant" by Bostick, Inc.
 - b. "BC-158" by Pecora Corporation
 - c. "PSI-301" by Polymeric Systems Inc.
 - d. "Tremco Butyl Sealant", by Tremco.

F. INTERIOR LATEX JOINT SEALANTS (typical interior applications except as indicated):
Comply with ASTM C834, Type P, Grade NF.

1. Acceptable Products include:

- a. "Sonolac" by BASF Building Systems.
- b. "Chem-Calk 600" by Bostik, Inc.
- c. "AC-20" by Pecora Corporation
- d. "Tremflex 834" by Tremco Incorporated.

G. INTERIOR FIRE RATED SEALANTS (typical for all interior wall and floor/ ceiling penetrations and joints in fire rated assemblies)

1. Basis of Design:

- a. 3M Fire Barrier Sealant CP 25WB+

2.3 JOINT-SEALANT BACKING

- A. PROVIDE SEALANT BACKINGS of material and type that are nonstaining and for fire rated applications as required; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. CYLINDRICAL SEALANT BACKINGS: ASTM C1330, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. ELASTOMERIC TUBING SEALANT BACKINGS: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. BOND-BREAKER TAPE: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. PRIMER: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. CLEANERS FOR NONPOROUS SURFACES: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. MASKING TAPE: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
- D. WEEPS: Absorbent, UV-resistant synthetic fiber rope, 3/8-inch minimum diameter, in length required to produce an initial 2-inch exposure on the exterior face extending through sealant backing into the internal drainage plane.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. EXAMINE JOINTS indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. SURFACE CLEANING OF JOINTS: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete and masonry.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include metal and glass.
- B. JOINT PRIMING: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. MASKING TAPE: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or

by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. COMPLY WITH joint-sealant manufacturer's written installation instructions for products and applications indicated (including fire rated applications), unless more stringent requirements apply.
- B. SEALANT INSTALLATION STANDARD: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. INSTALL SEALANT BACKINGS of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. INSTALL WEEPS IN SEALANT JOINTS above head and sill flashings, and in joints associated with the metal building flashing, at spacing not to exceed twenty-four (24)-inch centers. Install with weeps two (2)-inches outside of sealant joint face, and extend through the sealant backing into the internal drainage plane. After sealant is cured, cut off weeps flush with face of sealant joint.
- E. INSTALL BOND-BREAKER TAPE behind sealants where sealant backings are not used between sealants and backs of joints.
- F. INSTALL SEALANTS using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. TOOLING OF NONSAG SEALANTS: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C1193. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

- A. CLEAN OFF EXCESS SEALANT OR SEALANT SMEARS adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- B. PROTECT JOINT SEALANTS during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.5 JOINT / SEALANTS SCHEDULE:

- A. EXTERIOR PAVEMENT JOINTS: At perimeter of building at pavement (including sidewalks and curbs), and at pavement expansion Joints: Urethane
- B. EXTERIOR VERTICAL BUILDING JOINTS, at perimeters of door or vent frames (both sides) exterior wall penetrations, exterior building joints including masonry joints, and at masonry control joints: Exterior Silicone
- C. EXTERIOR DOOR THRESHOLDS: Butyl Rubber
- D. TYPICAL INTERIOR JOINTS: Latex
- E. INTERIOR SLAB-ON-GRADE JOINTS: Urethane

End of Section

08111 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SCOPE

- A. PROVIDE hollow metal doors and frames, where noted on the Drawings and as specified herein. The Work of this Section includes:
 - 1. Exterior Steel Doors & Frames: insulated and galvanized
 - 2. Interior Steel Doors & Frames: honeycomb core units typically, except:
 - a. Interior Electrical Room Door and frame: insulated and galvanized
 - 3. Shop priming and field finishing.

1.2 RELATED REQUIREMENTS:

- A. DIVISION-08 "DOOR HARDWARE" Section for hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. MINIMUM THICKNESS: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

- A. COORDINATE ANCHORAGE INSTALLATION for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. PRODUCT DATA: For each type of manufactured product. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. SHOP DRAWINGS: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.

8. Details of moldings, removable stops, and glazing.

C. DOOR AND FRAME SCHEDULE: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

A. DELIVER UNITS palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic. Provide additional protection to prevent damage to factory-finished units.

1. DELIVER WELDED FRAMES with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

B. INSPECT DOORS AND FRAMES upon delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. STORE DOORS AND FRAMES vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. If cardboard protection on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. AVAILABLE MANUFACTURERS: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Ceco Door; ASSA ABLOY (www.cecodoor.com)
2. Curries Company; ASSA ABLOY (www.curries.com)
3. Deansteel Manufacturing Company, Inc. (www.deansteal.com)
4. Republic Doors and Frames (www.republicdoor.com) .
5. Steelcraft; an Allegion brand (www.allegion.com)
6. Stiles Custom Metal, Inc. (www.stilesdoors.com)
7. Steward Steel; Door Division (www.stewardsteeldoors.com)

2.2 MATERIALS

- A. RECYCLED CONTENT OF STEEL PRODUCTS: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25-percent.
- B. COLD-ROLLED STEEL SHEET: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. HOT-ROLLED STEEL SHEET: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. METALLIC-COATED STEEL SHEET: ASTM A653, Commercial Steel (CS), Type B.
- E. GALVANIZED STEEL SHEETS: Zinc-coated carbon steel complying with ASTM A526, commercial quality, or ASTM A642, drawing quality, hot-dip galvanized according to ASTM A525, with A 60 or G 60 coating designation, mill phosphatized.
- F. POLYSTYRENE OR POLYURETHANE CORE: Foamed-in-place or laminated to both door faces, with density not less than 1.8 PCF and with compressive strength 20 PSI minimum. Bond strength to face sheets must exceed strength of the polystyrene core so that delaminating will not occur under any conditions. Voids in foam must not exceed 1/2-inch in any direction.
- G. INSERTS, BOLTS, AND FASTENERS: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A153, Class C or D as applicable.
- H. SUPPORTS AND ANCHORS: Fabricated from not less than 0.0478-inch-thick (18-gage) steel sheet; 0.0516-inch-thick (16-gage) galvanized steel where used with galvanized steel frames.
- I. POWER-ACTUATED FASTENERS IN CONCRETE: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- J. MINERAL-FIBER INSULATION: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- K. PRIMER: Shop-applied rust-inhibitive enamel paint, either air-drying or baked, suitable as a base for finish indicated in Division-09 "Painting" Section.

2.3 "STANDARD" STEEL DOORS AND FRAMES (PER SDI)

- A. REFERENCE STANDARD: Comply with applicable requirements of the Steel Door Institute's ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as indicated herein.
- B. FABRICATE per standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified, in size and door design type as indicated:

1. TYPICAL DOOR PANEL THICKNESS: 1-3/4-inch unless otherwise indicated
2. EDGE BEVELS (typical): Bevel lock and hinge edges 1/8-inch in 2-inches.

2.4 INTERIOR DOORS AND FRAMES:

- A. STANDARD CORE: Manufacturer's standard kraft-paper or polystyrene fill
- B. FIRE-RATED CORE: Manufacturer's standard laminated mineral board core
- C. EXPOSED FINISH: Prime
- D. LEVEL-3 EXTRA-HEAVY-DUTY DOORS AND FRAMES: Per ANSI/SDI A250.8; ANSI/SDI A250.4, Level A:
 1. Applications: Typical unless indicated otherwise
 2. Door Faces: Uncoated steel sheet, minimum 0.053-inch thick (16-gage)
 3. Door Edge Construction: Model 2, Seamless
 4. Frame Material: Uncoated sheet steel, 0.053-inch thick (16-gage)
 5. Frame construction: Mitered and full-profile welded

2.5 EXTERIOR DOORS & electrical room door AND FRAMES:

- A. DOOR EDGE CONSTRUCTION: Model 2, Seamless
- B. TOP EDGE CLOSURES: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- C. BOTTOM EDGES: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- D. INSULATED DOOR CORE: Foamed-in-place 1.8 PCF density polyurethane, filling door cavity, R-2.44 minimum
- E. FRAME CONSTRUCTION: Mitered, full profile, fully-welded
- F. EXPOSED FINISH: Prime coat over hot-dipped galvanizing - minimum A60 galvanized coating.
- G. LEVEL-3 EXTRA-HEAVY-DUTY DOORS AND FRAMES: ANSI/SDI A250.8; ANSI/SDI A250.4, Level A:
 1. DOOR FACES: Hot-dipped galvanized steel sheet, minimum 0.053-inch thick (16-gage) before coating

2.6 FRAME HARDWARE REINFORCEMENT:

- A. FABRICATE REINFORCEMENT PLATES from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123-inch (10-gage) thick by 1-1/2-inches-wide by 6-inches longer than hinge, secured by not less than 6 spot welds.
 2. Pivots: Minimum 0.167-inch (7-gage) thick by 1-1/2-inches-wide by 6-inches longer than hinge, secured by not less than 6 spot welds.
 3. Lock Face, flush Bolts, Closers, and Concealed Holders: Minimum 0.067-inch (14-gage) thick.
 4. All Other Surface-Mounted Hardware: Minimum 0.067-inch (14-gage) thick.
- B. SUPPORTS AND ANCHORS: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.
- 2.7 JAMB ANCHORS:
- A. TYPE: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated. Provide floor anchors for each jamb and mullion that extends to the floor.
 - B. QUANTITY: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor and provide one additional anchor for each 24-inches of frame height above 7-feet.
 - C. POST-INSTALLED EXPANSION TYPE for Precast Concrete: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame.
 - D. FLOOR ANCHORS: Formed from same material as frames, not less than 0.042-inch (18-gage) thick, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - E. DOOR SILENCERS: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
 - F. FIXED FRAME MOLDINGS: Formed integral with standard steel frames, minimum 5/8-inch-high, unless otherwise indicated.
- 2.8 GENERAL FABRICATION OF DOORS AND FRAMES:
- A. FABRICATE STEEL DOOR AND FRAME UNITS to be rigid, neat in appearance and free from defects, warp or buckle. Where possible, fit and assemble units in manufacturer's plant. Shop prime all hollow metal doors and frames.
 - B. INTERNAL DOOR CONSTRUCTION: One of the following manufacturer's standard core materials according to SDI standards:
 1. Rigid polystyrene conforming to ASTM C578.
 2. Rigid mineral fiber with internal sound deadener on inside of face sheets.
 - C. CLEARANCES: Not more than 1/8-inch at jambs and heads, except not more than 1/4-inch between non-fire-rated pairs of doors. Not more than 3/4-inch at bottom.

- D. FABRICATE EXPOSED FACES of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel sheet.
 - E. TOLERANCES: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
 - F. FABRICATE CONCEALED STIFFENERS, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
 - G. EXPOSED FASTENERS: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
 - H. THERMAL-RATED (INSULATING) ASSEMBLIES: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C236 or ASTM C976 on fully operable door assemblies.
 - I. HARDWARE PREPARATION: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
 - J. LOCATE HARDWARE as indicated on Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - K. PREFIT DOORS at factory with clearance of 1/8-inch at vertical edges and at top, 1/8-inch in 2-inch bevel at lock edge, bottom clearance: 3/8-inch without threshold, 3/4-inch with threshold, or as otherwise limited by NFPA-80.
- 2.9 SHOP FINISHING:
- A. SURFACE PREPARATION: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
 - B. PRETREATMENT: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
 - C. AT GALVANIZED STEEL SHEET FINISHES, apply zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II, for field painting.
 - D. FACTORY PRIMING FOR FIELD-PAINTED FINISH: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 PREPARATION

- A. REMOVE WELDED-IN SHIPPING SPREADERS installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. DRILL AND TAP DOORS AND FRAMES to receive non-templated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION - GENERAL

- A. INSTALL HOLLOW-METAL DOORS AND FRAMES plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. PLACING FRAMES: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
 - 2. At concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
- C. DOOR INSTALLATION: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

3.3 ADJUSTING AND CLEANING

- A. PRIME COAT TOUCHUP: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. PROTECTION REMOVAL: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

08700 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SCOPE

- A. PROVIDE DOOR HARDWARE at doors throughout the Project, as specified herein, and as necessary for complete installation.
 - 1. This Section includes items known commercially as finish or door hardware that are required for swing and sliding doors, and other doors to the extent indicated.
- B. The Work of this Section includes:
 - 1. Mechanical door hardware for swinging, sliding doors
 - 2. Cylinders specified for door locks that are specified in other Sections.
 - 3. Hardware for special types of unique hardware

1.2 RELATED DOCUMENTS:

- A. Comply with requirements in the “Blue River Wastewater Treatment Plant Biosolids Facility Basis of Design Report” (herein afterwards referred to as the BODR) - Section “5.3.4.11 Door Hardware”, which includes acceptable product manufacturers, and requirements for door hardware types.

1.3 RELATED SECTIONS

- A. APPLICABLE DIVISION-08 SECTIONS for doors and frames.

1.4 COORDINATION

- A. INSTALLATION TEMPLATES: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. OWNER’S SECURITY PROVIDER: Coordinate installation of door hardware, keying, and access control with the Owner's security consultant or service provider, as applicable.
- C. EXISTING OPENINGS: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.5 PREINSTALLATION MEETINGS

- A. **HARDWARE & KEYING COORDINATION MEETING:** Coordinate and manage a meeting between the Owner's representative and the hardware supplier's Architectural Hardware Consultant (AHC) to confirm requirements of specified hardware items before ordering, and to determine the final keying requirements.
1. Include the Owner's separate Security Consultant or Contractor in the coordination meetings, when applicable
 2. Provide a minimum of two (2) meetings, each to take not less than THREE (3) hours, with all meetings to be held at the project site or offices of the Owner (unless otherwise agreed to by Owner's representative).
 3. Review and finalize construction schedule and verify availability of materials.
 4. Review the required inspecting, testing, commissioning, and demonstration procedures
 5. Incorporate Owner's keying directions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Address for delivery of keys.
 6. Confirm decisions made in writing, and submit report within three (3) days after meeting.

1.6 ACTION SUBMITTALS

- A. **PRODUCT DATA** including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- B. **DOOR HARDWARE SCHEDULE:** Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. **FORMAT:** Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. **ORGANIZATION:** Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. CONTENT: Include the following information:

- a. Type, style, function, size, label, hand, and finish of each door hardware item.
- b. Manufacturer of each item.
- c. Fastenings and other pertinent information.
- d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
- e. Explanation of abbreviations, symbols, and codes contained in schedule.
- f. Mounting locations for door hardware.
- g. Door and frame sizes and materials.

C. WARRANTY INFORMATION for each product.

D. SUBMITTAL SEQUENCE: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

E. KEYING SCHEDULE: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

1.7 INFORMATION SUBMITTALS

A. QUALIFICATION DATA: For Installer and Architectural Hardware Consultant.

B. PRODUCT TEST REPORTS: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

C. FIELD QUALITY-CONTROL reports.

D. SAMPLE WARRANTY: For manufacturer's special warranty.

1.8 MAINTENANCE DATA:

A. Submit for each type of door hardware to include in Operations and Maintenance Manuals.

1.9 QUALITY ASSURANCE

A. SUPPLIER QUALIFICATIONS: A recognized Architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Architectural Hardware Consultant (AHC) who

will be available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation, in addition to the coordination meetings indicated, and with following capabilities.

1. **SCHEDULING RESPONSIBILITY:** Preparation of door hardware and keying schedule.
2. **ENGINEERING:** Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
3. **INSTALLER TRAINING:** Prior to installation of door hardware, conduct project specific training of hardware installers on the proper installation and adjustment of products. Training must include use of installation manuals, hardware schedules, templates and physical product samples as appropriate.

- B. **ARCHITECTURAL HARDWARE CONSULTANT QUALIFICATIONS:** A person experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC).
- C. **INSTALLER QUALIFICATIONS:** Installers must be trained and certified by the hardware manufacturer's representative on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals. Product training must be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors.

1.10 PRODUCT HANDLING

- A. **TAG EACH ITEM OR PACKAGE SEPARATELY** with identification related to final hardware schedule, and include basic installation instructions with each item or package. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- B. **INVENTORY DOOR HARDWARE** jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- C. **DELIVER INDIVIDUALLY PACKAGED DOOR HARDWARE ITEMS** promptly to place of installation (shop or Project site).
- D. **PROVIDE SECURE LOCK-UP** for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.11 WARRANTIES

- A. PROVIDE WRITTEN WARRANTY, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fail in materials or workmanship within the indicated warranty period after Substantial Completion of the Work. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- B. SPECIAL PRODUCT WARRANTY PERIODS (in addition to other contractual and/or implied warranties):
 - 1. Ten (10) years for mortise locks and latches.
 - 2. Seven (7) years for heavy duty cylindrical (bored) locks and latches.
 - 3. Five (5) years for exit hardware.
 - 4. Twenty-five (25) years for manual surface door closer bodies.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. FIRE-RATED DOOR ASSEMBLIES: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. MEANS OF EGRESS DOORS: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

2.2 GENERAL PRODUCT REQUIREMENTS:

- A. MANUFACTURER'S NAME PLATE: Do not use products with the manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. BASE METALS: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA

A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

- C. FASTENERS: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- D. FURNISH SCREWS FOR INSTALLATION with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
- E. PROVIDE CONCEALED FASTENERS for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.3 DOOR HARDWARE

- A. FOR HINGES, CONTINUOUS HINGES, MORTISE DOOR LOCKS & KEYING, SURFACE CLOSERS, EXIT DEVICES, STOPS, GASKETING, THRESHOLDS, and PROTECTIVE TRIM, Refer to the BOD for requirements.

2.4 MAINTENANCE TOOLS:

- A. PROVIDE A COMPLETE SET of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. EXAMINE OPENINGS, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
 1. Notify Architect of discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware.
 2. Proceed only after such discrepancies or conflicts have been resolved.

3.2 PREPARATION & INSTALLATION:

- A. Refer to the BOD, and as follows:
- B. **RETROFITTING:** Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing Work.
- C. **WEATHERSTRIPPING AND SEALS:** Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated. Do not notch perimeter units to install other surface-applied hardware. At meeting stile units, fasten to meeting stiles, forming seal when doors are closed.

3.3 ADJUSTING AND CLEANING

- A. **ADJUSTING:** Initially adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended:
 - 1. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 2. **Door Closers:** Adjust door closers immediately upon installation. Adjust in exact conformance with manufacturer's printed instructions. Advance backcheck to eliminate shock at dead stop. Set closer latching speed to assure unassisted positive latching. Degree of swing of door for self-limiting closers shall be maximum available.
 - 3. Adjust all exit devices immediately upon installation. Adjust in exact conformance with manufacturers' printed instructions.
- B. **FINAL ADJUSTMENTS:** At completion of the installation and prior to Substantial Completion, make final adjustments to door closures and other items of hardware. Leave all hardware clean and fully operable. Should any item be found to be defective, it shall be repaired or replaced as directed.
- C. **POST-OCCUPANCY ADJUSTMENT:** Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, and door hardware units.
- D. **CLEANING & PROTECTION:** Clean operating items as necessary for proper function and finish of hardware and doors. Clean adjacent surfaces soiled by hardware installation. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration.

3.4 FIELD-QUALITY CONTROL

- A. **HARDWARE SUPPLIER’S INSTALLATION COMPLIANCE REPORT:** At completion of installation, the Hardware Supplier (not the Installer) must perform a final observation of the installed door hardware, and prepare a written report to the Owner indicating whether the Work complies with or deviates from the door hardware manufacturer’s installation requirements, including whether door hardware is properly installed, operating and adjusted. At fire-rated doors, verify that installation complies with requirements of NFPA 80 “Standard for Fire Doors and Other Opening Protectives”, including its Paragraph 5.2.3 – Acceptance Testing.
- B. Repeat observation and report until all installed hardware complies with requirements.

3.5 DEMONSTRATION:

- A. **PROVIDE TRAINING** of Owner’s maintenance personnel to adjust, operate, and maintain door hardware.

3.6 CONTINUING MAINTENANCE SERVICE:

- A. **BEGINNING AT SUBSTANTIAL COMPLETION**, provide maintenance service by skilled employees of the door hardware Installer. At end of the Maintenance period, provide proposal to Owner for continued maintenance service.
- B. **INCLUDE QUARTERLY PREVENTIVE MAINTENANCE**, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation.
 - 1. Provide parts and supplies as used in the manufacturer and installation of the original Products.
- C. **MAINTENANCE PERIOD:** Provide twelve (12) months of continuing maintenance service.

3.7 HARDWARE SCHEDULE:

- A. **PROVIDE HARDWARE FOR EACH DOOR** in the Project, to comply with requirements above.
- B. **PROVIDE ALL ACCESSORY COMPONENTS AND RELATED ITEMS** required for operation even if not specifically indicated. Notify the Architect if discrepancies, conflicting hardware or missing items are discovered. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- C. **BASIS-OF-DESIGN (BOD) MANUFACTURER REFERENCES:**
 - 1. **HINGES:** IVE IVES Hardware
 - 2. **CONTINUOUS HINGES:** IVE IVES Hardware
 - 3. **LOCKSETS / LATCHSETS:** SCH Schlage L06 Series (levers only)

- | | | | |
|----|-------------------------------|-----|---|
| 4. | CYLINDERS: | SCH | Schlage High-Security removable-core type |
| 5. | SURFACE CLOSERS: | LCN | LCN Closers |
| 6. | EXIT DEVICES: | VON | Von Duprin |
| 7. | STOPS: | IVE | IVES Hardware |
| 8. | WEATHERSTRIPPING / GASKETING: | NGP | – National Guard Products |
| 9. | PROTECTIVE TRIM: | RO | Rockwood Manufacturing Company |

D. TYPICAL FINISHES (UNO): “STAINLESS-STEEL” (BHMA # 630) typical or as otherwise noted below:

1. Continuous aluminum hinges: Satin-anodized Aluminum

DOOR HARDWARE SETS:

SET # 1 - SINGLE EXTERIOR AIRLOCK DOOR W/ PANIC – DOOR # 60-102C:

- | | | |
|---|----------------|-------------------------|
| 1 EA CONTINUOUS HINGE | | |
| 1 EA PANIC / RIM TYPE EXIT DEVICE | VON | 99-L |
| 1 EA CYLINDER | SCH | (TYPE AS NECESSARY) |
| 1 EA CLOSER W/ STOP | LCN | 4040XP-3077CNS |
| 1 EA WALL STOP | IVE | WS406/407CVX |
| 1 EA KICKPLATE | RO | K1050-8"H X 2"LDW X B4E |
| 1 SET WEATHERSTRIPPING | NGP | 172NA - AT JAMBS & HEAD |
| 1 EA RAIN DRIP | NGP | 16A X DW+4" |
| - MOUNT TO FRAME ABOVE DOOR | | |
| 1 EA DOOR BOTTOM / SWEEP | NGP | 101VA |
| 1 EA ADA THRESHOLD W/ SEAL | NGP | 896N - 1/2" H X 5" |
| 1 EA LOCKGUARD | RO | 320 |
| 2 EA VIEWERS | DS (DOORSCOPE) | # DS238 |
| - MOUNT AT 43" (PER ADA) AND 60" AFF (FOR NORMAL) | | |

SET # 2 - SINGLE INTERIOR AIRLOCK DOOR W/ PANIC

- **DOOR #'S 60-102A, 60-102B, 60-102D, 60-103A, 60-104A**

- | | | |
|---|----------------|-------------------------|
| 1 EA CONTINUOUS HINGE | | |
| 1 EA PANIC / RIM TYPE EXIT DEVICE | VON | 99-L |
| 1 EA CYLINDER | SCH | (TYPE AS NECESSARY) |
| 1 EA CLOSER | LCN | 4040XP-3077CNS |
| 1 EA KICKPLATE | RO | K1050-8"H X 2"LDW X B4E |
| 1 SET WEATHER-STRIPPING | NGP | 172NA – AT JAMBS & HEAD |
| 1 EA DOOR BOTTOM / SWEEP | NGP | 101VA |
| 1 EA ADA THRESHOLD W/ SEAL | NGP | 896N - 1/2" H X 5" |
| 2 EA VIEWERS | DS (DOORSCOPE) | # DS238 |
| - MOUNT AT 43" (PER ADA) AND 60" AFF (FOR NORMAL) | | |

End of Section

08800 - GLAZING

PART 1 - GENERAL

1.1 SCOPE

- A. Provide glass and glazing where indicated on the Drawings, as specified herein, and as necessary for complete installation. This Section includes:
 - 1. Glass, glazing sealants, and glazing accessories

1.2 RELATED DOCUMENTS:

- A. COMPLY WITH requirements in the “Blue River Wastewater Treatment Plant Biosolids Facility Basis of Design Report (herein after referred to as the “BODR”) which includes requirements of acceptable product manufacturers and minimum product requirements.
- B. SPECIFICATION “085113 – ALUMINUM WINDOWS” Section, included as “Attachment 3”, in the “New Structure Concept Performance Specification” Document, prepared by Goodwin Brothers, dated March 25, 2020.

1.3 RELATED REQUIREMENTS:

- A. SPECIFICATION “08112 – FIBERGLASS DOORS AND FRAMES” Section, for fiberglass doors and frames with glazing.

1.4 DEFINITIONS

- A. AAMA: American Architectural Manufacturers Association
- B. ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials, for fire-rated partition walls
- C. GANA: Glass Association of North America
- D. GLASS FABRICATOR: Firm that cuts, edges, heat-strengthens, tempers, finishes, and assembles glass sheets manufactured by others into glass units and insulated assemblies ready for installation.
- E. GLASS MANUFACTURER: Firm that produces primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- F. GLASS THICKNESS: Indicated by thickness designations in millimeters per ASTM C1036

- G. FIRE-PROTECTION-RATED GLAZING: Glazing in fire-rated doors and openings, limited in size, and not capable of blocking radiant heat, but NOT meeting requirements of ASTM E119.
- H. FIRE-RESISTANCE-RATED GLAZING: Glazing in assemblies that prevent spread of fire and smoke and radiant heat; used in rated wall and door applications and meeting requirements of ASTM E119.
- I. IGMA: Insulated Glass Manufacturers Association
- J. INTERSPACE: Space between lites of an insulating glass unit.

1.5 COORDINATION

- A. COORDINATE GLAZING CHANNEL DIMENSIONS to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.6 ACTION SUBMITTALS

- A. PRODUCT DATA: for each type of product.
- B. SAMPLES: Submit 12-inch square samples of each type of glass product other than clear monolithic vision glass, including tinted, coated, insulating glass and spandrel glass units required. Provide insulating units with spacer and edge sealants.
- C. GLAZING ACCESSORY SAMPLES: For sealants and colored spacers, in 12-inch-lengths. Install sealant samples between two strips of material representative in color of adjoining framing system.
- D. GLAZING SCHEDULE: List glass types and thicknesses for each size opening and location. Use same designations as indicated in the Drawings.

1.7 INFORMATION SUBMITTALS

- A. QUALIFICATION DATA: For Installer, glass fabricator, glass testing agency and sealant testing agency (for structural silicone glazing only).
- B. PRODUCT TEST REPORTS for fabricated glass and glazing sealants for tests performed by a qualified testing agency. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- C. SAMPLE WARRANTIES: For special warranties.

1.8 QUALITY ASSURANCE

- A. GLASS FABRICATOR QUALIFICATIONS: A manufacturer of fabricated glass units who is approved or otherwise “qualified” by the primary glass manufacturer.

- B. **INSTALLER QUALIFICATIONS:** An experienced entity who has completed glazing similar in material, design, and extent to that indicated for the Project and whose work has resulted in construction with a record of successful in-service performance over a three (3) year period.

1.9 **DELIVERY, STORAGE, AND HANDLING:**

- A. **PROTECT GLAZING MATERIALS** according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. **COMPLY WITH INSULATING-GLASS MANUFACTURER'S** written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 **FIELD CONDITIONS**

- A. **ENVIRONMENTAL LIMITATIONS:** Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
- B. **DO NOT INSTALL LIQUID GLAZING SEALANTS** when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.11 **WARRANTIES:**

- A. **SPECIAL WARRANTY FOR INSULATED GLASS:** Manufacturer agrees to replace insulated glass units that deteriorate within the specified Warranty period. Deterioration is defined as failure of hermetic seal under normal use not attributed to glass breakage or to maintaining and cleaning insulated glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture or film on interior-surfaces of glass.

- 1. **WARRANTY PERIOD:** Ten (10)-years from date of Substantial Completion

PART 2 - PRODUCTS

- A. **MANUFACTURERS / SOURCE LIMITATIONS:** For each glass type and glazing accessory, obtain from a single manufacturer. Subject to compliance with requirements, manufacturers offering glass products include but are not limited to the following:

- 1. AGC Glass Company North America, Inc. (www.agc-yourglass.com)
- 2. Guardian Glass; SunGuard, 866-482-7347, (www.guardianglass.com)
- 3. Viracon Inc., (AGC – www.viracon.com)
- 4. Vitro Architectural Glass (formerly PPG Glass – www.vitroglazing.com)

2.2 PERFORMANCE REQUIREMENTS

- A. **PROVIDE GLASS LITES** for various size openings in thickness and strengths (heat treated or tempered) required to meet or exceed the following performance criteria. Glass thickness indicated either on the Drawings or within this Specification are minimum requirements and must be verified by analyzing Project loads and in-service conditions.
1. Minimum nominal glass lite thickness: 1/4-inch (6 mm)
- B. **GENERAL PERFORMANCE REQUIREMENTS:** Installed glazing must withstand normal thermal movement, wind and impact loads (for operating sash and doors) without failure, including:
1. loss or glass breakage attributable to defective manufacturer, fabrication, or installation,
 2. failure of sealants or gaskets to remain watertight and airtight,
 3. deterioration of glazing materials, and other defects in construction.
- C. **STRUCTURAL PERFORMANCE:** Glazing must withstand the following design loads within limits and under conditions indicated per the IBC and per ASTM E1300. Determine wind pressure per ASCE/SEI 7, based on heights above grade as indicated, and as follows:
1. Basic Wind Speed: 90 mph
 2. Importance Factor: 1.5
 3. Exposure Category: "C" unless higher category is indicated on the Structural Drawings
 4. Minimum uniform wind pressure loading: 30-PSF inward and 30-PSF outward.
 5. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for units set vertically or not more than 15 degrees off vertical and under wind action, with 60 second load duration.
 6. Maximum Lateral Deflection: For glass supported on all four (4) edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or one (1)-inch, whichever is less.
- D. **DIFFERENTIAL SHADING:** Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- E. **THERMAL MOVEMENTS:** Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- F. **WINDBORNE-DEBRIS-IMPACT RESISTANCE:** Provide exterior glazing passing basic-protection testing requirements in ASTM E1996 for Wind Zone 1 when tested according to ASTM E1886. Test specimens must be no smaller in width and length than glazing indicated for

use on the Project and must be installed in same manner as glazing indicated for use on the Project.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located more than 30 feet above grade.

G. THERMAL PERFORMANCE PROPERTIES: Provide glass with minimum performance properties as indicated.

1. TESTING PROCEDURE BASIS:

- a. For monolithic-glass lites, properties are based on units with lites 6.0 mm (1/4-inch) thick.
- b. For insulating-glass, properties are based on units of thickness indicated for overall unit and for each lite.

2. U-FACTORS: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.

3. SOLAR HEAT-GAIN COEFFICIENT (SHGC) and Visible Light Transmittance (VLT): Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

4. MINIMUM THERMAL PERFORMANCE FOR EXTERIOR GLAZING:

- | | | | |
|----|--|----------|-----------|
| a. | Maximum Winter U-Factor: | 0.38 Btu | |
| b. | Maximum Solar Heat Gain Coefficient (SHGC): | | |
| | Orientation: | SEW | N (North) |
| c. | Projection Factor (Pf) Less Than 0.2: | 0.36 | 0.48 |
| d. | Projection Factor Above 0.2 And Less Than 0.5: | 0.43 | 0.53 |
| e. | Projection Factor 0.5 Or More: | 0.58 | 0.58 |

2.3 GLASS PRODUCTS, GENERAL

A. GLAZING PUBLICATIONS: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

- B. SAFETY GLAZING: Where safety glass is indicated or required by the building code or AHJ, provide products which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.
 - 1. PERMANENTLY MARK safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to AHJ representatives.
- C. INSULATING-GLASS CERTIFICATION PROGRAM: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.
- D. MINIMUM GLASS THICKNESS: Where glass thickness is indicated, it is a minimum requirement. Provide glass that complies with structural performance requirements and is not less than thickness indicated.
 - 1. MINIMUM GLASS THICKNESS FOR EXTERIOR LITES: 6 mm (1/4-inch nominal).
- E. STRENGTH OF GLASS:
 - 1. Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article.
 - 2. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article.
 - 3. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. ANNEALED CLEAR FLOAT GLASS: ASTM C1036, Type I, Class I (clear), Quality-Q3, unless otherwise indicated.
- B. HEAT-STRENGTHENED FLOAT GLASS: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) or Class 2 (tinted) as indicated, Quality Q3.
 - 1. Fabricate by horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. TEMPERED GLASS: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabricate by horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. Provide tempered glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to AHJ representatives.
- D. REFLECTIVE- AND LOW-E-COATED VISION GLASS: ASTM C1376.

- E. CERAMIC-COATED VISION GLASS: ASTM C1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in NGA's "Engineering Standards Manual."

2.5 FIRE-PROTECTION-RATED GLAZING

- A. LABELING: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether glazing has passed hose-stream test; whether glazing meets 450 deg F temperature-rise limitation; and fire-resistance rating in minutes.
- B. FIRE-PROTECTION-RATED GLAZING: Listed and labeled by a testing agency acceptable to AHJ, for fire-protection ratings indicated, based on positive-pressure testing in accordance with NFPA 257 or UL 9, including hose-stream test, and shall comply with NFPA 80. Fire-protection-rated glazing does not meet ASTM E-119, NFPA 251, or UL 263 testing.
 - 1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes will be exempt from hose-stream test.
- C. FIRE-PROTECTION-RATED GLAZING ACCESSORIES: Manufacturer recommended units as follows:
 - 1. GLAZING TAPE: Closed cell polyvinyl chloride (PVC) foam equal to Pemko# FG3000S90 or Unifax Fiberfrax Alumino-Silicate fiber glazing tape.
 - 2. SETTING BLOCKS: Calcium silicate.

2.6 GLASS FABRICATIONS - GENERAL

- A. FABRICATE GLAZING UNITS in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. ALLOW FOR THERMAL MOVEMENTS from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- C. GRIND SMOOTH AND POLISH exposed glass edges and corners.

2.7 INSULATED-GLASS (IG) UNITS:

- A. FACTORY-ASSEMBLED UNITS consisting of sealed lites of glass separated by a hermetically sealed, dehydrated interspace with a perimeter spacer sealed to both lites, qualified in accordance with ASTM E2190, and as follows:

1. **WARM-EDGE PERIMETER SPACER:** Manufacturer’s standard molecular-sieve formulated desiccant filled hybrid thermoplastic and 3-side stainless-steel unit, continuously bent and mechanically joined.
2. **AIR SPACE:** 12 mm (1/2-inch) thick, filled with air or argon gas, as required to meet performance requirements
3. **SEALING SYSTEM:** Dual seal, with polyisobutylene (PIB) primary seal, and polysulfide secondary sealant, or silicone secondary sealant with structural (2-sided) glazing.
4. **TYPICAL INSULATED GLASS UNITS:** (unless otherwise indicated)
 - a. **Appearance / Tint:** Clear
 - b. **Outboard Lite:** Clear glass with low-E sputter coat on # 2 surface
 - c. **Inboard lite:** Clear
5. **VERIFY TYPICAL EXTERIOR INSULATED-GLASS PRODUCT** with Architect for approval.

2.8 **DIGITAL PRINTED GLASS:**

- A. **PROVIDE DIGITAL PRINTED GLASS** consisting of a ceramic “frit” in colors and patterns indicated, or as selected by the Architect from manufacturer’s standard screen-printing colors and pattern options, applied to one side of glass using a large-format printer, and thermally fused permanently to glass surface.
 1. Temper exterior glass after application to prevent glass breakage due to thermal stresses
- B. **BASIS-OF-DESIGN:** “Digital Glass Printing” by Insulite Glass, 913-780-2233, www.InsuliteGlass.com

2.9 **GLAZING SEALANTS:**

- A. **COMPATIBILITY:** Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. **SUSTAINABILITY:** Sealants used inside the weatherproofing system, must have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. **SUITABILITY:** Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- D. **ELASTOMERIC SEALANT STANDARD:** Provide manufacturer’s standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class and Uses.

- E. **COLORS OF EXPOSED GLAZING SEALANTS:** As selected by Architect from manufacturer's full range of industry colors.

- F. **NEUTRAL-CURING SILICONE GLAZING SEALANT:** Elastomeric, neutral-curing silicone sealant complying with ASTM C920, Type S (single component), Grade NS (nonsag), Class 25, Use NT (non-traffic); specially compounded and tested to show a minimum of 20 years resistance to deterioration in normal glazing applications.
 - 1. **Application:** Provide at exterior glazing.

 - 2. **Available Products:** Subject to compliance with requirements, the following products are acceptable:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. Pecora Corporation; 890.
 - d. Sika Corporation, Construction Products Division; SikaSil-C990.
 - e. Tremco Incorporated; Spectrem 1.

- G. **ONE-PART ACID-CURING SILICONE GLAZING SEALANT:** Type S; Grade NS; Class 25; Uses NT.
 - 1. **Available Products:** Subject to compliance with requirements, the following products are acceptable:
 - a. "Chem-Calk 1200"; by Bostick Construction Products Div.
 - b. "Dow Corning 999"; by Dow Corning Corporation
 - c. "SCS 1200"; by General Electric Corporation
 - d. "863"; by Pecora Corporation
 - e. "Proglaze"; by Tremco, Inc.

- H. **ONE-PART NON-ACID CURING SILICONE GLAZING SEALANT:** Type S, Grade NS, Class 25, Uses NT.
 - 1. **Medium Modulus:** Tensile strength not less than 45 or more than 75 PSI at 100% elongation when tested per ASTM D412 after 14-days at 77-deg F and 50% relative humidity.

 - 2. **Available Products:** Subject to compliance with requirements, the following products are acceptable:
 - a. "Dow Corning 795"; by Dow Corning Corporation
 - b. "Silpruf"; by General Electric Corporation
 - c. "Gesil"; by General Electric Corporation
 - d. "Spectrum 2"; by Tremco, Inc.

2.10 **GLAZING TAPES:**

- A. **PREFORMED BUTYL-BASED BACK-BEDDING GLAZING TAPE:** 100-percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or

without spacer rod as recommended by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. GLAZING TAPE WITHOUT SPACE ROD:

1. “Chem-Tape 40”; Bostick Construction Products Div.
2. “Extru-Seal”; Pecora Corporation
3. “Tremco 440 Tape”; Tremco, Inc.

C. GLAZING TAPE WITH SPACE ROD:

1. “Chem-Tape 60”; Bostick Construction Products Division
2. “Shim-Seal”; Pecora Corporation
3. “Pre-shimmed Tremco 440 Tape”; Tremco Inc.

2.11 MISCELLANEOUS GLAZING MATERIALS:

- A. PROVIDE MISCELLANEOUS GLAZING MATERIALS including cleaners, primers and sealers, setting blocks, spacers and edge blocks of size and shape complying with referenced glazing standards, compatible with glazing sealants, and with requirements of glass manufacturer for application indicated.
- B. SETTING BLOCKS: EPDM, silicone or neoprene blocks, with Shore A durometer hardness of 85, plus or minus 5.
- C. SPACERS: Neoprene, EPDM or silicone blocks, or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. EDGE BLOCKS: EPDM, Silicone, or Neoprene with Shore A durometer hardness per manufacturer's written instructions to limit lateral movement (side-walking) of glass.
- E. COMPRESSIBLE RODS: Provide cylindrical glazing sealant backing materials per ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and for optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. EXAMINE FRAMING, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. PROCEED WITH INSTALLATION only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. CLEAN GLAZING CHANNELS and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. EXAMINE GLAZING UNITS to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 SAFETY GLASS INSTALLATION

- A. INSTALL TEMPERED GLASS where indicated, in all door units, and at the following locations – even if not indicated:
 - 1. When glass is sixty (60)-inches horizontally from a door in any position (open or closed), and
 - 2. When a glass lite is within eighteen (18)-inches from the finished floor.

3.4 GLAZING, GENERAL

- A. COMPLY WITH combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. INSTALL INSULATING GLASS UNITS to comply with recommendations of the Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

- C. PROTECT GLASS EDGES from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance. Use suction cups to shift glass within openings – do not raise or drift glass with a pry bar.
- D. APPLY PRIMERS TO JOINT SURFACES where required for adhesion of sealants, as determined by preconstruction testing.
- E. INSTALL SETTING BLOCKS in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. DO NOT EXCEED EDGE PRESSURES stipulated by glass manufacturers for installing glass lites.
- G. PROVIDE SPACERS for glass lites where length plus width is larger than 50-inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch-minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. PROVIDE EDGE BLOCKING where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.
- I. SET GLASS LITES IN EACH SERIES with uniform pattern, draw, bow, and similar characteristics. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.5 TAPE GLAZING

- A. POSITION TAPES ON FIXED STOPS so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. INSTALL TAPES CONTINUOUSLY, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. COVER VERTICAL FRAMING JOINTS by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. PLACE JOINTS IN TAPES AT CORNERS OF OPENING with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

- E. DO NOT REMOVE RELEASE PAPER FROM TAPE until right before each glazing unit is installed.
- F. APPLY HEEL BEAD of elastomeric sealant, unless otherwise recommended by glazing or aluminum framing manufacturer.
- G. CENTER GLASS LITES IN OPENINGS on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. APPLY CAP BEAD of elastomeric sealant over exposed edge of tape.

3.6 GASKET GLAZING (DRY)

- A. CUT COMPRESSION GASKETS to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. INSERT SOFT COMPRESSION GASKET between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. INSTALLATION WITH DRIVE-IN WEDGE GASKETS: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- D. INSTALLATION WITH PRESSURE-GLAZING STOPS: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. INSTALL GASKETS so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

- A. INSTALL CONTINUOUS SPACERS, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. FORCE SEALANTS INTO GLAZING CHANNELS to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. TOOL EXPOSED SURFACES OF SEALANTS to provide a substantial wash away from glass.

3.8 INSTALLATION OF FIRE-PROTECTION RATED GLAZING:

- A. INSTALL UNITS only into fire-rated frames, using methods approved by testing agencies that listed and labeled the fire-resistant glazing products

3.9 PROTECTION

- A. PROTECT EXTERIOR GLASS FROM BREAKAGE immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass.
- B. PROTECT GLASS from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
- C. If despite protection, remove contaminating substances immediately if contaminating substances do contact glass, as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- D. REMOVE AND REPLACE GLASS that is damaged during construction period or that is damaged by contaminating materials.

3.10 CLEANING

- A. REMOVE NON-PERMANENT LABELS and clean surfaces, immediately after installation.
- B. WASH GLASS ON BOTH EXPOSED SURFACES not more than four (4)-days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

End of Section

09510 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. **WORK INCLUDED:** Provide continuous wall-to-wall acoustical panel ceiling systems as indicated on the Drawings, as specified herein, and as needed to meet the requirements of the construction indicated. The Work includes:
 - 1. Acoustical Ceiling Panels
 - 2. Exposed grid suspension systems
 - 3. Wire hangers, fasteners, main runners, cross tees, wall-angle moldings, and perimeter trims.

1.2 ACTION SUBMITTALS

- A. **PRODUCT DATA** including manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system.
- B. **SAMPLES:** Minimum 6-inch square samples of acoustical panels, and 6-inch long sample of exposed wall molding and suspension system, including main-runner and cross tee.

1.3 INFORMATION SUBMITTALS

- A. **MAINTENANCE DATA:** For manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performance.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. **FURNISH EXTRA MATERIALS** that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. **ACOUSTICAL CEILING UNITS:** Full-size panels equal to five (5)-percent of quantity installed.
- C. **EXPOSED SUSPENSION SYSTEM COMPONENTS:** Quantity of each exposed component equal to five (5)-percent of quantity installed.

1.5 QUALITY ASSURANCE

- A. **INSTALLER QUALIFICATIONS:** Firm with not less than three (3) years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. **DELIVER** acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. **BEFORE INSTALLING ACOUSTICAL PANELS,** permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

- A. **ENVIRONMENTAL LIMITATIONS:** Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS:

2.1 MANUFACTURERS:

- A. **SOURCE LIMITATIONS:** Obtain each type of acoustical ceiling panel and its supporting suspension system from a single source and from a single manufacturer.
- B. **BASIS-OF-DESIGN:** Armstrong Ceiling & Wall Solutions, 877-276-7876, www.armstrongceilings.com, or approved equivalent.

2.2 PERFORMANCE REQUIREMENTS:

- A. **SURFACE-BURNING CHARACTERISTICS:** Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A per ASTM E1264.
 - 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

- A. ACOUSTICAL PANEL STANDARD: Provide manufacturer's standard acoustical panels meeting ASTM E1264, with no added formaldehyde, and as designated by type, form, pattern, acoustical rating, and light reflectance, unless otherwise indicated.
- B. TYPICAL ACOUSTICAL PANEL CEILING (2x2 Tegular edged fiberglass – for 9/16-inch wide steel grid):
 - 1. Description / Type: Glass-fiber-based panel with “plant-based” binder
 - 2. Panel Size: 24-inch by 24-inch nominal square panels, 1-inch thick
 - 3. Surface Texture / Color: Fine, white color, with 0.90 light reflectance
 - 4. Acoustical Rating: Noise Reduction Coefficient (NRC) of 0.95 per ASTM C423
 - 5. Edge Profile: Tegular, for 9/16-inch wide grid
 - 6. BASIS-OF-DESIGN: #3251PB “OPTIMA Plant Based Tegular” by Armstrong Ceilings.

2.4 METAL SUSPENSION SYSTEMS

- A. METAL SUSPENSION-SYSTEM STANDARD: Provide manufacturer's standard, direct-hung, metal suspension system and accessories per ASTM C635 and designated by type, structural classification, and finish indicated.
- B. NARROW-FACED, CAPPED, DOUBLE-WEB STEEL SUSPENSION SYSTEM: Main and cross runners roll formed from hot-dipped galvanized coating; with prefinished 9/16-inch-wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. Face Design: Flat, flush.
 - 3. Cap Material: Galvanized cold-rolled steel sheet with manufacturer’s standard powder-coat finish, in color to match ceiling panels (white typically) unless otherwise indicated.
 - 4. BASIS-OF-DESIGN: “Interlude XL High Recycled content (HRC) 9/16-inch Exposed Tee” by Armstrong Ceilings, in “Blizzard White” powder-coat finish to match ceiling panels, unless otherwise indicated.

2.5 ACCESSORIES

- A. ATTACHMENT DEVICES: Capable of sustaining, without failure, a load equal to 5 times of that imposed by construction as determined by testing according to ASTM E488 by a qualified independent testing agency. Comply with seismic design requirements, when applicable:

- B. EXPANSION-ANCHOR HANGERS INTO CONCRETE: Post-installed expansion-anchors fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires, with ICC-ES evaluation report based on ICC-ES AC193 acceptable to the AHJ.
- C. POWDER-ACTUATED HANGERS INTO CONCRETE: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by a qualified independent testing agency.
- D. CORROSION-RESISTANT MATERIALS FOR INTERIOR LOCATIONS: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
- E. VERTICAL SUSPENSION WIRES: ASTM A641, pre-stretched soft-temper carbon steel wire with Class 1 galvanized zinc coating, with a yield-stress load of at least four (4)-times the load of suspended materials, and as follows:
 - 1. Minimum wire size: not less than 0.106-inch-diameter (# 12 AWG) wire (for up to 94 lbs total load per wire)
 - 2. Maximum Spacing of Suspension Wires: Four (4)-feet OC each way.

2.6 METAL EDGE MOLDINGS

- A. ROLL-FORMED, SHEET-METAL EDGE MOLDINGS: Manufacturer's standard moldings for edges and penetrations formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings must fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. EXAMINE SUBSTRATES, AREAS, AND CONDITIONS, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. EXAMINE ACOUSTICAL PANELS before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- B. PROCEED WITH INSTALLATION only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. MEASURE EACH CEILING AREA and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated and comply with layout shown on reflected ceiling plans.
- B. LAYOUT OPENINGS for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. INSTALL ACOUSTICAL PANEL CEILINGS per ASTM C636 and manufacturer's written instructions.
- B. SUSPEND CEILING HANGERS from building's structural members and as follows:
 1. INSTALL HANGERS PLUMB and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. INSTALL SUPPLEMENTAL SUSPENSION MEMBERS where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members. Install supplemental members and hangers in form of trapezes or equivalent devices.
 3. SECURE WIRE HANGERS to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
- C. DO NOT SUPPORT CEILINGS DIRECTLY FROM permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical anchors, or power-actuated fasteners that extend through forms into concrete.
- D. WHEN STRUCTURE ABOVE DOES NOT PERMIT installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 1. SIZE SUPPLEMENTAL SUSPENSION MEMBERS and hangers to support ceiling loads within performance limits established by referenced standards.

- E. SECURE BRACING WIRES TO CEILING SUSPENSION MEMBERS and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- F. INSTALL EDGE MOLDINGS AND TRIM at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. SCREW ATTACH MOLDINGS TO SUBSTRATE at intervals not more than 16-inches OC and not more than 3-inches from ends. Miter corners accurately and connect securely.
 - 2. DO NOT USE EXPOSED FASTENERS, including pop rivets, on moldings and trim.
- G. INSTALL SUSPENSION-SYSTEM RUNNERS so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- H. INSTALL ACOUSTICAL PANELS with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
 - 1. FOR REVEAL-EDGED PANELS on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 - 2. PAINT CUT EDGES OF PANEL REMAINING EXPOSED after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 ERECTION TOLERANCES

- A. SUSPENDED CEILINGS: Install main and cross runners level to a tolerance of 1/8-inch in 12-feet, non-cumulative.
- B. MOLDINGS AND TRIM: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8-inch in 12-feet, non-cumulative.

3.5 CLEANING

- A. CLEAN EXPOSED SURFACES of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. REMOVE AND REPLACE CEILING COMPONENTS that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

End of Section

09651 – RESILIENT BASE

PART 1 - GENERAL

1.1 SCOPE

- A. PROVIDE resilient wall base and accessories, where noted on the drawings and as specified herein.

1.2 ACTION SUBMITTALS

- A. PRODUCT DATA: Submit Manufacturers information and installation instructions for each type of Product.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. STORE RESILIENT PRODUCTS and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, not less than 50-deg-F or more than 90-deg-F.

1.4 FIELD CONDITIONS

- A. MAINTAIN AMBIENT TEMPERATURES within range recommended by manufacturer, but not less than 70-deg-F or more than 95-deg-F, In spaces to receive resilient products during the following periods:
 - 1. 48-hours before installation.
 - 2. During installation.
 - 3. 48-hours after installation.
- B. AFTER INSTALLATION and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55-deg-F or more than 95-deg-F.
- C. INSTALL RESILIENT PRODUCTS after other finishing operations, including painting, have been completed.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

- A. **SOURCE LIMITATIONS:** Obtain each type resilient base product from a single source and from a single manufacturer.
- B. **AVAILABLE MANUFACTURERS:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Burke Flooring Products Division, 800-447-8442, www.burkeflooring.com
 - 2. Flexco Division., Textile Rubber Co., 800-633-3151, www.flexcofloors.com
 - 3. Johnsonite, a Tarkett Company, 800-899-8916, <https://commercial.tarkett.com>
 - 4. Roppe Rubber Corp., 800-537-9527, www.roppe.com

3.2 PERFORMANCE REQUIREMENTS

- A. **GENERAL:** Provide materials meeting ASTM F1861 “Standard Specification for Resilient Wall Base” as follows.
- B. **FIRE-TEST-RESPONSE CHARACTERISTICS:** As determined by testing identical products per ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. **CRITICAL RADIANT FLUX CLASSIFICATION:** Class I, not less than 0.45 W/sq. cm.
 - 2. **SMOKE DENSITY:** less than 450 per ASTM E662.
- C. **FLEXIBILITY:** Will not crack, break, or show signs of fatigue when bent around a 1-1/4-inch diameter cylinder when tested per ASTM F137 “Standard Test Method for flexibility of Resilient Flooring Materials”.
- D. **COLOR STABILITY:** Meets Or exceeds ASTM F1861 for color stability when tested to ASTM F1515 “Standard Test Method for Measuring Light Stability of Resilient flooring”.
- E. **SUSTAINABILITY:** Contains at least 14% pre-consumer recycled content, and is 100% recyclable.

3.3 RESILIENT WALL BASE:

- A. **TYPICAL WALL BASE:** Minimum 0.125-inch-thick meeting ASTM F1861 Type TP (rubber, ThermoPlastic) , Group 1 (solid, homogeneous), and the following:
 - 1. **STYLE AND APPLICATIONS** (except as otherwise indicated on the Drawings):
 - a. **Style B: Cove** - for areas with other hard-surfaced floor finish materials indicated

- B. HEIGHT: 4-inch unless otherwise indicated.
- C. COLOR: As indicated on Drawings, or as selected by Architect from manufacturer's full range of available color options.
- D. PRE-FORMED OUTSIDE CORNERS: Units matching wall base material, color and height, with minimum 4-inch returns on both sides of corners.
- E. INSIDE CORNERS: Job-formed or preformed units.
- F. BASIS-OF-DESIGN: "Duracove Thermoplastic rubber 1/8-inch", by Johnsonite, or equal

3.4 INSTALLATION MATERIALS

- A. ADHESIVES: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- B. TROWELABLE LEVELING AND PATCHING COMPOUNDS (for flooring applications): Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

PART 4 - EXECUTION

4.1 EXAMINATION

- A. EXAMINE SUBSTRATES, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. VERIFY THAT FINISHES OF SUBSTRATES COMPLY with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. PROCEED WITH INSTALLATION only after unsatisfactory conditions have been corrected. Installation of resilient products indicates acceptance of surfaces and conditions.

4.2 PREPARATION

- A. PREPARE SUBSTRATES according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. FILL CRACKS, HOLES, AND DEPRESSIONS in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. DO NOT INSTALL RESILIENT PRODUCTS until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

- D. IMMEDIATELY BEFORE INSTALLATION, sweep and vacuum clean substrates to be covered by resilient products.

4.3 RESILIENT BASE INSTALLATION

- A. COMPLY WITH manufacturer's written instructions for installing resilient base.
- B. APPLY RESILIENT BASE TO walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. INSTALL RESILIENT BASE IN LENGTHS as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. TIGHTLY ADHERE RESILIENT BASE TO SUBSTRATE throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 1. Do not stretch resilient base during installation.
- E. ON IRREGULAR SUBSTRATES, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- F. PREFORMED OUTSIDE CORNERS: Install before installing straight pieces.
- G. JOB-FORMED INSIDE CORNERS: Use straight pieces of maximum lengths possible and form with returns not less than 3-inches in length. Miter or cope corners to minimize open joints.

4.4 RESILIENT ACCESSORY INSTALLATION

- A. COMPLY WITH manufacturer's written instructions for installing resilient accessories.
- B. RESILIENT MOLDING ACCESSORIES: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

4.5 CLEANING AND PROTECTION

- A. COMPLY WITH manufacturer's written instructions for cleaning and protecting resilient products.
- B. PERFORM THE FOLLOWING OPERATIONS immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.

- C. PROTECT RESILIENT PRODUCTS from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. COVER RESILIENT PRODUCTS SUBJECT TO WEAR AND FOOT TRAFFIC until Substantial Completion.

END OF SECTION

096723 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. PROVIDE a seamless resinous flooring system with integral cove base, where indicated and as indicated herein. The Work of this Section includes:
 - 1. PREPARATION, patching and repair of concrete substrate
 - 2. ON-SITE VERIFICATION TESTING of substrate for substrate humidity.
 - 3. INSTALLATION OF MOISTURE VAPOR EMISSION (MVE) Control, if not integral within slab-on-grade concrete floor, or if MVE testing indicates values above amount permitted by manufacturer of resinous flooring system.

1.2 ACTION SUBMITTALS

- A. MANUFACTURER CERTIFICATION: Provide letter of certification from flooring manufacturer indicating that installer is an Approved Applicator of flooring system and is familiar with proper procedures and installation requirements required by manufacturer.
- B. SUBMIT PRODUCT DATA including material specifications, installation instructions, and installation recommendations from the manufacturer.

1.3 INFORMATION SUBMITTALS

- A. CERTIFICATE OF ACCEPTANCE of substrate conditions, signed by Contractor and Installer, indicating written acceptance of floor substrate conditions before beginning Work, and referencing acceptability of test reports performed.
- B. SUBMIT MAINTENANCE INSTRUCTIONS and manufacturer's recommended maintenance practices for each type of flooring required.

1.4 QUALITY ASSURANCE:

- A. REGULATORY COMPLIANCE: Comply with applicable requirements of the United States Department of Agriculture (USDA), the Food & Drug Administration (FDA), and with requirements of the local Health Department. Comply with the Indoor Air Quality (IAQ) requirements of California Section 01350 as verified by a qualified independent testing laboratory (submit testing report upon request).
- B. INSTALLER QUALIFICATIONS: Approved applicator by resinous flooring manufacturer, with a minimum of 15 resinous flooring applications within last 3 years similar in type and size

to Work of this Contract. Assign experienced installer from previous applications including lead trades-person.

- C. **MATERIAL COMPATIBILITY:** provide primers and undercoat material produced by the same manufacturer as the finish coats. Use only thinners recommended by the manufacturer, and only within recommended limits.

1.5 **DELIVERY, STORAGE AND HANDLING:**

- A. **STORE MATERIALS** in dry, enclosed area protected from exposure to moisture. Maintain temperature of storage area between 60- and 90-degrees-F. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.6 **JOB CONDITIONS:**

- A. **PROTECT** the Work of other trades, whether to be coated or not, against damage from coating. Correct damage by cleaning, repairing, replacing, and recoating as acceptable to the Architect. Leave in an undamaged condition.
- B. **SAFETY:** Take necessary precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application special flooring materials.
- C. **FIELD CONDITIONS:** Areas of installation must be broom clean and reasonably dust free, with adequately controlled ventilation and uniform, bright lighting of not less than 50 FC. Maintain a minimum temperature of 55 degrees F for not less than three (3) days before installation, and for not less than 48 hours after completion of installation.

PART 2 - PRODUCTS

2.1 **MANUFACTURER**

- A. **BASIS-OF-DESIGN:** “3-Coat High-Build Solid Color System” with “Self-Prime HS” pigmented polyaspartic coating and “Clear Coat HS” clear polyaspartic sealer, by Flexmar Coatings Inc., 724-33901442, or equal.
- B. **ACCEPTABLE MANUFACTURERS:** Subject to compliance with requirements of this Section, and equivalency of performance characteristics with the Basis-of-Design Product indicated above, products by the following manufacturers are also acceptable:
 - 1. Desco Coatings
 - 2. Dex-O-Tex
 - 3. Dur-A-Flex, Inc,
 - 4. General Polymers,

5. Neogard,
 6. Stonhard,
 7. Tnemec
 8. Tennant Company,
- C. **SYSTEM DESCRIPTION:** Abrasion, impact-, and chemical-resistant, commercial and industrial, solid color polyaspartic-aliphatic-polyurea-based, monolithic floor surfacing designed to produce a seamless floor finish with an integral cove base, and as follows:
1. **COLOR AND PATTERN:** As selected by Architect from Manufacturer's full range of available options.
 2. **WEARING SURFACE:** Textured for slip resistance
 3. **OVERALL SYSTEM THICKNESS:** Between 12- to 21-mils DFT.
 4. **DRY TIME:** 1- to 2-hour return-to-service after final coat; 1-hour recoat between coats.
 5. **BODY COATS:** Pigmented polyaspartic coating, 2 coats:
 - a. Resin: Polyaspartic aliphatic polyurea.
 - b. Formulation Description: High solids.
 - c. VOC Content: 0 VOC, virtually no odor.
 - d. Application Method: Roller, squeegee, or trowel.
 - e. Thickness of Coats: 4 to 7 mils DFT.
 - f. Number of Coats: Two
 6. **TOPCOAT:** Clear polyaspartic sealer
 - a. Resin: Polyaspartic aliphatic polyurea.
 - b. Formulation Description: High solids.
 - c. VOC Content: 0 VOC, virtually no odor.
 - d. Type: Clear.
 - e. Finish: Matte
 - f. Number of Coats: One, with anti-slip additive.
 - g. Thickness: 4- to 7-mils DFT
 7. **SYSTEM PHYSICAL PROPERTIES:** Provide floor coating system with the following minimum physical property requirements when tested according to test methods indicated:
 - a. Adhesion to Concrete: 300 psi concrete cohesive failure per ASTM-D 4541 Elcometer.
 - b. Tensile Strength: 4,500 psi per ASTM-D 412.
 - c. Falling Sand Abrasion Resistance: ASTM-D 968.
 - d. Clear Coat: 32 quarts sand/dry mil.
 - e. Color Coat: 40 quarts sand/dry mil.
 - f. Taber Abrasion: 0.34-0.43 grain weight loss per ASTM-D 4060, CS-17 wheel, 35.3 oz load, 1,000 rev.

- g. Flexibility Mandrel Bend: No cracking or peeling, per ASTM-D 522, 1/8-inch
 - h. Impact: 160/160 in.-lb direct/reverse, no cracking per ASTM-D 2794.
 - i. Hardness: 77 Shore D per ASTM-D 2240.
 - j. Flammability: Self-extinguishing per ASTM-D 635.
8. **SYSTEM CHEMICAL RESISTANCE:** Test specimens of cured floor coatings systems are unaffected when tested according to manufacturer's Chemical Resistance Chart per ASTM-D 1308 spot testing.

2.2 MVE-CONTROL SYSTEM:

- A. ASTM F3010-QUALIFIED, fluid-applied, epoxy-resin, membrane-forming system; formulated for application on concrete substrates to reduce MVER to level required for installation of resinous flooring system indicated, and acceptable to manufacturers of floor covering products.
- B. **PERFORMANCE REQUIREMENTS**
 - 1. **MVE-CONTROL SYSTEM CAPABILITIES:** Capable of suppressing MVE without failure when installed on concrete that exhibits the following conditions:
 - a. MVER: Maximum 25 lbs of water/1000 sq. ft. when tested according to ASTM F1869.
 - b. RELATIVE HUMIDITY: Maximum 100 percent when tested according to ASTM F2170 using in situ probes.
 - c. WATER-VAPOR TRANSMISSION: Through MVE-control system, maximum 0.085 perm when tested per ASTM E96.
 - d. TENSILE BOND STRENGTH to damp concrete: greater than 200 psi with failure in the concrete according to ASTM D7234.
- C. **SUBSTRATE PRIMER:** Provide MVE-control system manufacturer's concrete-substrate primer if required for system indicated by substrate conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. EXAMINE substrates and conditions under which coating will be performed for compliance with requirements.
- B. **SUBSTRATE MOISTURE MITIGATION VERIFICATION TESTING:** Verify that substrate concrete slab complies with manufacturer's requirements by on-site testing:
 - 1. Use a "Tramax" concrete moisture detection device, firmly applied to concrete substrate. If readings are higher than permitted by the manufacturer, preform an additional ASTM F2170 "in-situ" Relative Humidity Test.
 - 2. Application of flooring system may proceed only if test results are below 75 percent relative concrete humidity.

- C. **INSTALLATION OF VAPOR MITIGATION SYSTEM:** If test readings are not acceptable to the flooring system manufacturer, apply a vapor mitigation system approved by the Manufacturer of the Resinous Flooring system to the concrete substrate.
- D. **DO NOT BEGIN SURFACE PREPARATION** or application of flooring system until unacceptable conditions are corrected.

3.2 PREPARATION - PROTECTION

- A. **PROTECTION OF IN-PLACE CONDITIONS:** Protect adjacent surfaces and adjoining walls from contact with flooring system materials.

3.3 SURFACE PREPARATION:

- A. **PREPARE CONCRETE SURFACES** in accordance with manufacturer's instructions.
 - 1. Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, sealers, silicones, and other surface contaminants which could adversely affect application of flooring system.
 - 2. Clean existing surfaces with manufacturer's recommended cleaner. Remove all traces of cleaner from slabs and allow to dry thoroughly. Test for concrete sealer by pouring a small amount of muriatic-acid on the floor in several locations. If "frothing" occurs instantly, the existing floor sealer remains.
- B. **PATCH DEPRESSIONS, divots, and cracks** in concrete in accordance with manufacturer's instructions.
- C. **MECHANICALLY REMOVE** loose, delaminated, and damaged concrete and repair in accordance with manufacturer's instructions.
- D. **JOINTS:** Fill joints in accordance with manufacturer's instructions.

3.4 INTEGRAL COVE BASE APPLICATION

- A. **APPLY COVE BASE MIX** to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
 - 1. Integral Cove Base Height: 6-inches, or as otherwise indicated on the Drawings.

3.5 APPLICATION OF FLOOR FINISH COATING:

- A. **INITIATION OF COATING APPLICATION** represents acceptance and approval of substrate conditions by the Installer.
- B. **PRIME CLEAN AND** prepared concrete substrate per manufacturer's instructions, and allow to fully cure. Prime wall base surfaces, in accordance with recommendations of manufacturer.

- C. APPLY MASKING TAPE at bottom of door frames, around pipes and conduits in the floor surface, and against adjacent surfaces wherever coating is intended to terminate. Protect the Work of other trades, whether to be coated or not, against damage from the coating or from coating applications.
- D. MIX, PREPARE AND APPLY MATERIALS in full compliance with the manufacturer's instructions. Stir materials before application to produce a mixture of uniform density, and as required during application.
- E. APPLY primer to prepared surfaces, by spray, roller or brush. Apply evenly without puddles. Allow primer to become tacky for approximately 30 minutes before applying base coat.
- F. APPLY BASE COAT to obtain a uniform surface appearance, Sand ridges, if any, with coarse sandpaper before applying additional coats. Apply successive coats at a 90-degree angle to the previous application.
- G. APPLY TOP FINISH COAT over build coat(s) with a smooth, uniform surface appearance, perpendicular to previous coat, per manufacturer's recommendations.
- H. REMOVE, REFINISH OR RECOAT work not in compliance with these requirements.
- I. CLEAN adjacent spattered surfaces upon completion of work. Remove spattered coatings by washing, scraping or other proper methods, using care not to scratch or damage adjacent finished surfaces. Correct damage to other trades by cleaning, repairing, replacing, and recoating as acceptable to the Owner. Leave in an undamaged condition.
- J. PROVIDE caution signs to protect newly-applied finishes. Remove temporary protective wrappings after completion of coating operations. Do not allow any water on coated surfaces for 48 hours after installation, and do not allow any traffic on floor until fully cured.

END OF SECTION

09920 - PAINTING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. PROVIDE SURFACE PREPARATION AND APPLICATION OF PAINT FINISHES to surfaces exposed to view, throughout the Project and in accordance with requirements herein.
- B. PAINT EXPOSED FIRE-SUPPRESSION, MECHANICAL, ELECTRICAL AND PLUMBING system components, in accordance with this Section, and per additional requirements within applicable Division-21 through Division-28 Sections.
- C. PAINT FINISH ALL EXPOSED SURFACES (unless prefinished) whether painting is specifically designated in the Drawings or not. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas.
- D. PAINTING IS NOT REQUIRED on the following, unless otherwise indicated:
 - 1. Surfaces of anodized aluminum, stainless steel, chromium plate and similar “finished” materials
 - 2. Electrical equipment (except for exposed distribution cabinets or electrical devices and panels).
 - 3. Surfaces such as walls or ceilings in concealed or inaccessible areas, including utility tunnels, pipe spaces, duct shafts, or interstitial spaces above ceilings.
 - 4. Do not paint over code-required labels (UL or FMG) or equipment identification, warning or performance / instructional labels.
 - 5. Do not paint moving parts of operating mechanical or electrical units, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts and similar items, unless otherwise indicated.

1.2 RELATED REQUIREMENTS

- A. APPLICABLE DIVISION-05 SECTIONS for shop-priming of metal surfaces and substrates.
- B. APPLICABLE DIVISION-21 THROUGH DIVISION-28 SECTIONS for additional painting requirements of Fire Suppression, Plumbing, HVAC, Electrical, Communications and Electronic Safety and Security components.

1.3 DEFINITIONS

- A. DFT: Dry Film Thickness, in mils (0.001-inch)

- B. EXPOSED SURFACES: Includes areas visible when permanent or built-in fixtures, convector covers, grilles, and similar components are in place.
- C. MPI GLOSS LEVELS:
- D. LEVEL 1 (Flat or Matte): Not more than five units at 60 degrees and 10 units at 85 degrees, per ASTM D523.
- E. LEVEL 2 (velvet-like): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, per ASTM D523.
- F. LEVEL 3 (Eggshell-like): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, per ASTM D523.
- G. LEVEL 4 (Satin-like): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, per ASTM D523.
- H. LEVEL 5 (Semi-gloss): 35 to 70 units at 60 degrees, per ASTM D523.
- I. LEVEL 6 (Gloss): 70 to 85 units at 60 degrees, per ASTM D523.
- J. LEVEL 7 (High-gloss): More than 85 units at 60 degrees, per ASTM D523.

1.4 COORDINATION

- A. REVIEW OTHER SECTIONS in which primers are provided to ensure compatibility of the total system for various substrates. Upon request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1.5 ACTION SUBMITTALS

- A. PRODUCT DATA: For each type of product, including VOC content. Include preparation requirements and application instructions. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. SAMPLES FOR INITIAL SELECTION: For each type of topcoat product.
- C. SAMPLES FOR VERIFICATION: For each type of paint system and in each color and gloss of topcoat.
 1. Submit Color Samples on rigid hardboard, 8-1/2 by 11-inch minimum.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- D. PAINT SCHEDULE: Based on information included in the Drawings, or otherwise provided by the Architect, indicate rooms, areas and elements of paint applications, cross-referenced to paint

material systems and with color designations to be installed. Use same designations indicated on Drawings and in schedules.

1.6 INFORMATION SUBMITTALS

- A. MAINTENANCE DATA to include in Operations and Maintenance manuals required in Division-01 “Closeout Submittals” Section. Include the following:
 - 1. Updated Paint Schedule, indicating paint product and colors installed in each room, area, or construction element.
 - 2. Manufacturer’s Product Data Information
 - 3. Cleaning and stain-removal recommendations, with touch-up procedures.
 - 4. Material Safety Data Sheets
 - 5. Record Color Samples: for each paint material and color installed (3 each samples minimum)

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. FURNISH EXTRA MATERIALS from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. PAINT: 5-percent, but not less than 1-gal. of each material and color applied.

1.8 QUALITY ASSURANCE

- A. USE ONLY SKILLED PAINTERS for mixing and applying paint. Quality workmanship is required. In the acceptance or rejection of finish painting, no allowance will be made for the painters' lack of skill or for inadequate lighting conditions during painting operations.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. DELIVER MATERIALS to job site in original, new and unopened packages and containers bearing manufacturer's name and product identification labels.
- B. STORE MATERIALS NOT IN USE in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45-deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.10 FIELD CONDITIONS

- A. SAFETY: Take all precautions to ensure that workers and Work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.
- B. APPLY PAINTS only when temperature of surfaces and ambient air temperatures are between 50- and 95-deg F.
- C. DO NOT APPLY PAINTS when relative humidity exceeds 85-percent; at temperatures less than 5-deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. SOURCE LIMITATIONS: Obtain paint products, including but not limited to block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- B. MANUFACTURER: Provide paint products by Manufacturers that are listed in, and in compliance with the Master Painters Institute (MPI) “Approved Products List” (www.paintinfo.com).

2.2 PAINT PRODUCTS - GENERAL

- A. COLORS / FINISH SHEENS: Refer to Drawings for paint colors and sheens required, or as selected by the Architect from manufacturer’s full range of available color / sheen options.
- B. MATERIAL QUALITY Provide the best quality grade of the various types of paint materials as regularly manufactured. Materials not displaying manufacturers identification as a standard, best-grade product will not be acceptable.
- C. MATERIAL COMPATIBILITY: Materials for use within each paint system must be compatible with one another and the substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 1. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. EXAMINE SUBSTRATES, AREAS, AND CONDITIONS, with Applicator present, for compliance with requirements, including maximum moisture content and other conditions affecting performance of the Work.

- B. **MAXIMUM MOISTURE CONTENT OF SUBSTRATES:** When measured with an electronic moisture meter as follows:
- C. Concrete, Fiber-cement board, and Masonry (Clay and CMUs): 12-percent.
- D. Wood: 15-percent.
- E. **VERIFY SUITABILITY OF SUBSTRATES,** including surface conditions and compatibility, with existing finishes and primers.
- F. **PROCEED WITH APPLICATION** only after unsatisfactory conditions have been corrected. Application of coating indicates acceptance of surfaces and conditions.
- G. **VERIFY COLORS** to be provided before application of primers.

3.2 PREPARATION

- A. **COMPLY WITH MANUFACTURER'S WRITTEN INSTRUCTIONS** and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. **REMOVE HARDWARE,** covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. **CLEAN SUBSTRATES** of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. **CEMENTITIOUS AND MASONRY SUBSTRATES:** Remove release agents, curing compounds, efflorescence, chalk, dust dirt, grease, oils, and roughen surfaces to remove glaze, if exists. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
 - 1. **DETERMINE ALKALINITY AND MOISTURE CONTENT OF SURFACES** by performing appropriate tests.
- E. **APPLY APPROPRIATE COATINGS** to correct unacceptable conditions, per paint manufacturer's written instructions.
- F. **STEEL SUBSTRATES:** Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 2 and SSPC-SP 3.

2. SHOP-PRIMED STEEL SUBSTRATES: Clean field welds, bolted connections, and areas where shop paint is abraded. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up shop-applied prime coats that have been damaged with the same material as used for shop priming per SSPC-PA 1 for touching up shop-primed surfaces.
3. GALVANIZED-METAL SUBSTRATES: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Consult paint manufacturer if galvanized-metal is chromate passivated for appropriate surface preparation and primers.

G. ALUMINUM SUBSTRATES: Remove loose surface oxidation.

3.3 APPLICATION

A. APPLY PAINTS according to manufacturer's written instructions and per recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. BLOCK FILLERS: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

C. PROVIDE BARRIER COATS over incompatible primers or remove and re-prime.

D. TINT EACH UNDERCOAT a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

1. IF UNDERCOATS OR OTHER CONDITIONS SHOW THROUGH topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

E. APPLY PAINTS TO PRODUCE SURFACE FILMS without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

F. TOUCH-UP SUCTION- OR HOT-SPOTS IN CEMENT or plaster that are noticeable after application of the first coat, before applying subsequent coats.

- G. THE NUMBER OF COATS AND THE FILM THICKNESS required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the paint manufacturer.
- H. SAND BETWEEN COATS if sanding is required to produce a smooth, even surface according to manufacturer's written instructions.
- I. MINIMUM COATING FINISH SYSTEM THICKNESS: Apply each coat at not less than manufacturer's recommended spreading rate, to provide a total DFT for the entire coating system (prime and finish coats) as follows:
 - 1. For two-coats: 3.5 mils
 - 2. For three-coats: 5.0 mils.
- J. PIGMENTED (OPAQUE) FINISHES: Completely cover surfaces to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. MATCH APPROVED MOCKUPS OR SAMPLES for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 PAINTING FIRE SUPPRESSION, PLUMBING, HVAC/MECHANICAL, ELECTRICAL, COMMUNICATION, AND ELECTRONIC SAFETY AND SECURITY WORK:

- A. PAINT THE FOLLOWING ITEMS when exposed to view in occupied areas, including storage, service, support and equipment rooms:
 - 1. Mechanical and plumbing piping, pipe covering and jacket, supports and anchors
 - 2. Metal and plastic conduits, buss, supports and anchors.
 - 3. Mechanical equipment, heating unit covers, connector covers and grilles, tanks that do not have a factory-applied final finish, un-insulated ducts and duct insulation with a paintable jacket material.
 - 4. Electrical conduits, wireways, buss, supports and anchors.
 - 5. Exposed panels and panel-faces of recessed electrical, communications, or safety and security panels

3.5 FIELD QUALITY CONTROL

- A. DRY FILM THICKNESS TESTING: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Touch up and restore painted surfaces damaged by testing.
- B. IF TEST RESULTS INDICATE that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor must pay for testing and apply

additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

- A. AT END OF EACH WORKDAY, REMOVE RUBBISH, empty cans, rags, and other discarded materials from Project site.
- B. AFTER COMPLETING PAINT APPLICATION, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. PROTECT WORK OF OTHER TRADES against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. PROVIDE “WET PAINT” SIGNS as required by site conditions, to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their Work, after completion of painting operations.
- E. AT COMPLETION OF CONSTRUCTION ACTIVITIES OF OTHER TRADES, touch up and restore damaged or defaced painted surfaces.
 - 1. PAINT MATERIALS SCHEDULE:
 - 2. (RE: www.paintinfo.com for MPI’s “Approved Product List”)

3.7 EXTERIOR FINISHES:

- A. CONCRETE STRUCTURE (back side of parapets) – SATIN EPOXY:
 - 1. PRIMER: MPI # 3 Primer, Alkali Resistant, Water Based
 - a. BASIS-OF-DESIGN: “Loxon Concrete & Masonry Primer” by SW
 - 2. TWO (2) FINISH COATS: MPI # 161 Light Industrial Coating, Exterior, Water Based, eggshell-like (MPI Gloss Level 3)
 - a. BASIS OF DESIGN: “Pro Industrial DTM Acrylic Eg-Shel” by SW
- B. EXTERIOR FERROUS METAL: SEMI-GLOSS ALKYD
 - 1. PRIMER: MPI # 23 - Primer, Metal, Surface Tolerant (w/ SSPC SP1 + SP 2 or SP3 prep)
 - a. Note: Primer not required to be applied in field on pre-primed items
 - b. BASIS-OF-DESIGN: “Protective & Marine Kem Bond HS” by SW
 - 2. TWO (2) FINISH COATS: MPI # 94 - Alkyd, Exterior, Semi-Gloss (MPI Gloss Level 5)
 - a. BASIS-OF-DESIGN: “Protective & Marine DTM Alkyd Semi-Gloss” by SW

C. EXTERIOR ZINC-COATED (GALVANIZED) METAL: SEMI-GLOSS ALKYD:

1. PRIMER: MPI # 101 – Primer, Epoxy, Anti-Corrosive for Metal
 - a. BASIS-OF-DESIGN: “Protective & Marine Coatings Dura-Plate 235 Multi-Purpose Epoxy” by SW
 - b. NOTE: Primer not required to be applied in field on pre-primed items
2. TWO (2) FINISH COATS: MPI # 94 - Alkyd, Exterior, Semi-Gloss (MPI Gloss Level 5)
 - a. BASIS-OF-DESIGN: “Protective & Marine DTM Alkyd Semi-Gloss” by SW

3.8 INTERIOR FINISHES:

A. CMUs AND CONCRETE STRUCTURE – SATIN EPOXY:

1. PRIMERS / BLOCK FILLER:
 - a. BLOCK-FILLER for CMUs: MPI # 4 Block Filler, Latex Interior/Exterior:
 - 1) BASIS-OF-DESIGN: “Pro Industrial Heavy Duty Block Filler” by SW
 - b. PRIMER for CMUs & Concrete: MPI # 3 Primer, Alkali Resistant, Water Based
 - 1) BASIS-OF-DESIGN: “Loxon Concrete & Masonry Primer” by SW
2. TWO (2) FINISH COATS: MPI # 151 Light Industrial Coating, Interior, Water Based, eggshell-like (MPI Gloss Level 3)
 - a. BASIS OF DESIGN: “Pro Industrial Pre-Cat Epoxy Eg-Shel” by SW

B. FERROUS OR GALVANIZED METAL – SEMI-GLOSS EPOXY:

1. PRIMER: MPI # 134 Primer, Water Based:
 - a. BASIS-OF-DESIGN: “Pro Industrial DTM Acrylic Primer/Finish” by SW
2. TWO (2) Finish Coats: MPI # 153 Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)
 - a. BASIS OF DESIGN: Pro Industrial Pre-Cat Epoxy Semi-Gloss” by SW

END OF SECTION

10100 - VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. PROVIDE MARKERBOARDS where indicated, in accordance with requirements specified herein, and as required for a complete and proper installation.

1.2 SUBMITTALS

- A. SUMMIT PRODUCT DATA for each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. SUBMIT SHOP DRAWINGS for visual display surfaces when product data does not indicate unit size, installation details and attachments to other work.
- C. SUBMIT SAMPLES FOR VERIFICATION: For each type of visual display surface indicated.
 - 1. Markerboard Surface: Not less than 8-1/2 by 11 inches.
 - 2. Accessories: Full-size Sample of each type of accessory.
- D. SUBMIT OPERATION AND MAINTENANCE DATA for visual display surfaces to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. SURFACE-BURNING CHARACTERISTICS: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. DELIVER FACTORY-BUILT MARKERBOARDS completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site.

10100 – Visual Display Boards

1. STORE UNITS vertically with packing materials between each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURER:

- A. SOURCE LIMITATIONS: Obtain visual display surfaces from single source from single manufacturer.
- B. ACCEPTABLE MANUFACTURERS: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

A-1 Visual Systems, 800-423-3386, www.a-1visualsystems.com

Claridge Products and Equipment, Inc.,

800-434-4610, www.claridgeproducts.com

Egan Visual Inc., 800-263-2387, www.egan.com

2.2 DRY-ERASE MAGNETIC WHITEBOARDS:

- A. Fabricated assembly consisting of a 6-mm (1/4-inch)-thick low-iron ultra-clear tempered glass panel, laminated to a steel backing for use with rare-earth magnetic “tacks”, suitable for use with standard dry-erase markers, with square, eased corners and pencil-polished edges on all sides for direct-to-wall flush mounting:
 1. Surface Color “Brilliant White” or equivalent
 2. Unit Size, as indicated on the Drawings - custom sizes if indicated
 3. Provide four (4)-each rare-earth magnets per panel
 4. Basis-of-Design: “Claridge Glass – Magnetic Dry Erase Whiteboard” by Claridge.

2.3 MARKER/ERASER TRAY

- A. Manufacturer's standard solid extruded aluminum unit with ribbed section and smoothly curved exposed ends.
 - 1. Provide one (1)-unit with each markerboard
 - 2. Size: width to match marker board width.
 - 3. Anchorage: Magnetic mounting to markerboard panel

PART 3 - EXECUTION

- A. EXAMINE SUBSTRATES AND CONDITIONS, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work. Examine walls and partitions for proper preparation and backing for visual display surfaces. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. INSTALL UNITS in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- C. ANCHOR UNITS by attaching manufacturer's provided mounts to wall surfaces and to visual display boards with fasteners at spacing or locations as recommended by manufacturer. Secure both top and bottom of panels to walls.
- D. CLEANING AND PROTECTION: Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room. Touch up factory-applied finishes to restore damaged or soiled areas. Cover and protect visual display surfaces after installation and cleaning.

End of Section

10140 - SIGNAGE

PART 1 - GENERAL

1.1 SCOPE

- A. PROVIDE signage to comply with requirements indicated for manufacturing process, material finishes, style, size and message content, as specified herein, and as required for a complete and proper installation. Types of signage required include to the following:
 - 1. Interior Door Signs, with accessible raised-letter text and with braille characters

1.2 SUBMITTALS

- A. SUBMIT SHOP DRAWINGS of signage items prior to fabrication and erection. Include plans, elevations and large-scale details of fabrication, text, and layout, when applicable. Show details of anchorages to other materials, connector housings, and accessory items.
- B. COMPLY WITH applicable requirements of the Americans with Disabilities Act (ADA), requirements of the Building Code, including but not limited to accessibility requirements of ANSI A117.1 (most recent edition), and local regulations or ordinances.

PART 2 - PRODUCTS

2.1 SIGN MATERIALS

- A. PHOTO-SENSITIVE PLASTIC SHEET: Multi-layer, ultraviolet resistant, moisture-resistant, non-glare interior type photosensitive photopolymer sheet with minimum 1/8-inch-thick PETG base material, and with a “background” or “second surface” to be painted with non-glare acrylic paint in a contrasting color to the remaining character surface, in colors as selected by the Owner from manufacturer’s full range of available color options
- B. SURFACE BURNING CHARACTERISTICS: Flame spread not more than 75, and smoke development rating of 120 maximum when tested in per ASTM E84.

2.2 FABRICATED ITEMS:

- A. ACCESSIBLE DOOR SIGNAGE: 6 x 8-inch (minimum – or larger per text included) radius cornered tactile accessible sign units of photo-sensitive plastic sheet, with raised letters and with 1/32-inch Grade II Braille text corresponding to the written text, and meeting requirements of ANSI A117.1 and the 2010 ADA Standards, in manufacturer’s standard color(s) as selected by Owner, with a matte finish.

1. FABRICATION: Camera-ready artwork is reproduced onto the photosensitive surface and exposed to light – with the background surface removed where not exposed, producing an integrated solid sign panel.
 - a. Laminated photopolymers, added-on characters, and engraved character door signs are not acceptable.
2. LETTER STYLE: As selected by Owner, and as follows:
 - a. CHARACTER PROPORTIONS: Width to-height ratio between 3:5 and 1:1 and a stroke width-to-height ratio between 1:5 and 1:10.
 - b. COLOR CONTRAST: Characters and symbols must contrast with the background - either light characters on a dark background or dark characters on a light background.
3. RAISED CHARACTERS or SYMBOLS: Letters and numbers on signs must be raised 1/32-inch minimum and be “sans serif” type font. Raised characters or symbols must be at least 5/8-inch in height, but not more than 2-inches. Symbols or pictograms on signs must be raised 1/32 in minimum.
4. ADHESIVE MOUNTING: Double sided 1/32" thick Scotchmount tape for attaching at 60-inch above floor to center of sign on the wall adjacent to the latch side of a door and centered 9-inches from the door’s edge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. INSTALL signage in accordance with the approved shop drawings, to be level, plumb, and at height indicated, free from distortion or other defects of appearance. Remove and reinstall signage materials that do not comply with these requirements.
- B. MOUNT accessible room signs directly onto wall surface centered nine (9)-inches from the strike-side edge of the door, at 60-inches AFF to center of sign. Use double sided foam tape to mount to smooth non-porous surfaces.
- C. CLEAN soiled sign surfaces and protect units from damage until Substantial Completion.

3.2 SIGN SCHEDULE – TYPICAL TEXT REQUIRED:

- A. EXIT DOOR SIGNS, at doors with illuminated “exit” signs, with pictorial symbol and text reading:
 - a. “EXIT”
- B. DOOR SIGNS (at each door in the project, unless otherwise indicated by the Owner), with “Room Number” text (as directed by Owner), and with text reading as follows:

10140 – Signage

- a. "ELECTRICAL ROOM" at doors entering into rooms indicated as "Electrical" or "Electrical Rooms"
- b. Other Room Names (similar to above), at doors entering into rooms with names as indicated in the Room Finish Schedule on the Drawings

End of Section

10281 – TOILET ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. PROVIDE TOILET ACCESSORIES throughout the project, as specified herein, and as required for a complete and proper installation. Provide units as indicated on the Drawings.

1.2 COORDINATION:

- A. Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.3 REGULATORY & REFERENCED STANDARDS

- A. COMPLY WITH the following, as applicable:
 - 1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):
 - a. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
 - 2. AMERICANS WITH DISABILITIES ACT (ADA) Accessibility Guidelines (ADAAG), Section 407

1.4 SUBMITTALS

- A. SUBMIT PRODUCT DATA for each accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
- B. PROVIDE SETTING DRAWINGS where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
- C. SUBMIT MAINTENANCE INSTRUCTIONS including replaceable parts and service recommendations.

1.5 WARRANTIES:

- A. SPECIAL PRODUCT WARRANTY: Manufacturer shall unconditionally guarantee toilet accessories for minimum of five (5) years against failure.

10281 – Toilet Accessories

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **SINGLE-SOURCE RESPONSIBILITY:** Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.
- B. **ACCEPTABLE MANUFACTURERS OF TOILET ACCESSORIES:** Subject to compliance with requirements, provide toilet accessories by one of the following:
 - 1. American Specialties, Inc.,
 - 2. Bradley Corporation,
 - 3. Bobrick Washroom Equipment, Inc. or
 - 4. McKinney/Parker.

2.2 MATERIALS:

- A. **STAINLESS STEEL:** AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.
- B. **BAKED ENAMEL FINISH:** Factory-applied, gloss white, baked acrylic enamel coating.
- C. **MIRROR GLASS:** Nominal 6.0-mm (0.25-inch) thick, conforming to ASTM C1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.
- D. **FASTENERS:** Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.
- E. **KEYS & CYLINDERS:** Provide universal keys, with all cylinders keyed alike, for access to toilet accessory units requiring internal access for servicing, re-supply, etc. Provide minimum of six keys to Owner's representative.
- F. **TOILET ACCESSORY SCHEDULE:** Refer to Drawing for toilet accessory units required.

PART 3 - EXECUTION

- A. **INSTALL TOILET ACCESSORY** units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.
 - 1. **INSTALL GRAB BARS** to withstand a downward load of at least 250 lbs, complying with ASTM F446.

- B. SECURE MIRRORS TO WALLS in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. ADJUST TOILET ACCESSORIES for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- D. CLEAN AND POLISH all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings

END OF SECTION

10431 - AUTOMATED EXTERNAL DEFIBRILLATOR (AED) & CABINET

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide an automatic external defibrillator (AED) and cabinet where indicated, as specified herein, and as required for a complete and proper installation.

1.2 REFERENCE STANDARDS:

- A. AMERICAN HEART ASSOCIATION (AHA) Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, most recent edition.

1.3 COORDINATION:

- A. COORDINATE LOCATIONS, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing.

1.4 SUBMITTALS

- A. SUBMIT PRODUCT DATA for each product required. For cabinets, include rough in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials. Shop Drawings:

1.5 QUALITY ASSURANCE:

- A. INSTALLERS Provide experienced and qualified technicians to install defibrillator cabinets.
- B. MANUFACTURER'S INSTRUCTIONS: Comply with manufacturer's written data and installation instructions, including product technical bulletins, product catalog installation instructions, and product carton installation instructions.

PART 3 - PRODUCTS

3.1 ACCEPTABLE MANUFACTURERS:

- A. SUBJECT TO COMPLIANCE with requirements, products of the following manufactures are acceptable:
1. American Specialties, Inc.; ASI Group.
 2. Fire-End & Croker Corporation.
 3. JL Industries, Inc / Activar Construction Products Group, Inc. (BOD)
 4. Kidde Residential and Commercial Division.
 5. Larsens Manufacturing Company.

3.2 AED CABINET:

- A. PROVIDE 14 x 14 x 6-3/4-inch deep formed cold-rolled steel tub with white colored impact-resistant powder-coat finish, and as follows:
1. DOOR: 1-1/2-inch-wide cold-rolled steel trim frame with white powder-coat finish, mounted in a 5/8" door stop with zinc-plated handle, roller catch and continuous hinge.
 2. VIEW WINDOW: Full acrylic glazing with red silkscreened AED graphic with heart symbol
 3. SEMI-RECESSED TRIM-STYLE: One-piece combination cabinet with integral three (3)-inch deep trim and perimeter door frame overlapping surrounding wall surface with rolled-edge wall return at outer edge, for minimum 3-3/4-inch wall recess, unless a surface-mounted cabinet is indicated.
 4. ALARM: 9-volt DC battery-powered illuminated flashing-strobe with 85 db audible alarm that operates when door is opened and stops when door is closed, with low-power battery indicator and with on/off key-switch on exterior of cabinet (semi-recessed or surface mounted trim-style only).
 5. BASIS-OF-DESIGN: "Lifstart 1400 Series" by JL Industries / Activar Construction Products Group Inc., P: 800-554-6077, www.activarcpg.com .

3.3 AUTOMATED EXTERNAL DEFIBRILLATOR (AED) UNIT:

- A. BASIS-OF-DESIGN: "Lifepak CR Plus" by Medtronic ERS, or equal

PART 5 - EXECUTION

5.1 EXAMINATION:

- A. VERIFY THAT SUBSTRATES installed under other Sections are acceptable for product installation in accordance with manufacturer's instructions prior to installation of defibrillator cabinets.
 - 1. Inform Contractor of unacceptable conditions immediately upon discovery.
 - 2. Proceed with installation only after unacceptable conditions have been remedied.
- B. INSTALL at locations as indicated, with operating cabinet hardware not higher than 48-inches above floor level (per ADA).
- C. ARRANGE EQUIPMENT so that removal for repairs or replacement does not require undue dismantling or removing of other equipment components.

5.2 ADJUSTING AND CLEANING

- A. REMOVE TEMPORARY PROTECTIVE COVERINGS and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. ADJUST CABINET DOORS to operate easily without binding. Verify that alarm devices operate properly.
- C. CLEAN INTERIOR AND EXTERIOR SURFACES as recommended by manufacturer, upon completion of cabinet installation.
 - 1. Touch up marred finishes, or replace cabinets that cannot be restored to factory-finished appearance.
 - 2. Use only materials and procedures recommended or furnished by cabinet manufacturers.
 - 3. Replace cabinets and AED units that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

5.3 DEMONSTRATION:

- A. INSTRUCT OWNER'S MAINTENANCE PERSONNEL in care, adjustment and operation of cabinets and AED units.

END OF SECTION

10431 – AED & Cabinet

10440 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE

- A. PROVIDE Fire-Extinguishers (FE) where indicated
- B. PROVIDE AN EMERGENCY KEY-ACCESS BOX for fire-department use, at each building.

1.2 COORDINATION:

- A. COORDINATE LOCATIONS, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing.

1.3 SUBMITTALS

- A. SUBMIT PRODUCT DATA for each type of product specified.
 - 1. For wall-mounted fire extinguishers, include details showing mounting methods.
- B. SUBMIT MAINTENANCE INSTRUCTIONS including service recommendations.

1.4 QUALITY ASSURANCE

- A. UL-LISTED PRODUCTS: For fire extinguishers, provide UL-listed units bearing the UL "Listing Mark" for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. SINGLE-SOURCE RESPONSIBILITY: Obtain fire extinguishers and cabinets from one source from a single manufacturer.

B. ACCEPTABLE MANUFACTURERS: Subject to compliance with requirements, products of the following manufactures are acceptable:

1. American Specialties, Inc.; ASI Group.
2. Fire-End & Croker Corporation.
3. JL Industries / Activar Construction Products Group (Basis-of-Design)
4. Kidde Residential and Commercial Division.
5. Larsens Manufacturing Company.

2.2 TYPICAL FIRE EXTINGUISHERS (FE):

A. MANUFACTURER'S STANDARD multipurpose dry chemical type unit, 10 lb. capacity, UL rated: 4A-80BC, unless otherwise indicated:

1. BASIS-OF-DESIGN: "Cosmic 10E" # MB846 by JL.

2.3 MOUNTING BRACKETS:

A. MANUFACTURER'S STANDARD, stainless-steel unit, provided at each fire-extinguisher unit. Design brackets to secure fire extinguisher of sizes, types and capacities required, to prevent accidental dislodgement of extinguisher unit.

2.4 SIGNAGE:

A. PROVIDE WALL SIGNAGE DECALS and lettering as required by AHJ representatives for letter style, size, spacing, and location. Locate as directed.

2.5 EMERGENCY KEY-ACCESS BOX:

A. UL-LISTED ASSEMBLY meeting requirements of local fire-department, fabricated from 1/4-inch-thick steel plate, meeting UL 1037, UL 1610, UL 1332, and UL 437, with 1/2-inch-thick steel door and interior gasket weather seal with a stainless-steel door hinge, and finished with manufacturer's standard weather-resistant finish:

1. SIZE: four (4)-inch-high by five (5)-inch-wide by 3-7/8-inch deep
2. MOUNTING: Recessed wall-mount (unless not feasible per wall construction), with wall-mount flange of seven (7)-inch square steel matching key-box fabrication, with 6-1/2-inch-high x 6-1/2-inch-wide x 5-inch deep recessed wall-mount kit (RMK) for installation within masonry walls.
3. COLOR: Black, unless otherwise indicated

4. ACCESSORIES: Provide optional UL-listed “tamper alert” and connect to building’s alarm system

B. ACCEPTABLE PRODUCT: KnoxBox Series # 3200, by Knox Company, P: 800.552.5669, www.knoxbox.com

PART 3 - EXECUTION

3.1 INSTALLATION

A. INSTALL UNITS in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of AHJ.

1. Where exact location of bracket-mounted fire extinguishers is not indicated, locate as directed by Architect, and per approval of the AHJ.

3.2 ADJUSTING AND CLEANING

A. REMOVE TEMPORARY PROTECTIVE COVERINGS, if any, as extinguishers are installed.

B. CLEAN SURFACES as recommended by manufacturer, upon completion of installation.

C. TOUCH UP MARRED FINISHES, or replace units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection unit manufacturers.

D. REPLACE UNITS that are damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

End of Section

SECTION 13500 – INSTRUMENTATION AND CONTROL SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

- A. This section covers the furnishing and installation of an instrumentation and control system designated as the Supervisory Control and Data Acquisition (SCADA) System.
- B. The system shall be furnished as specified, complete with all software, human machine interface (HMI) hardware, input/output hardware, instrumentation, and all devices, accessories, appurtenances, testing, and training necessary for proper operation.
- C. The I&C System Supplier shall furnish all labor, materials, equipment and incidentals associated with the SCADA system as necessary to comply with requirements as shown on Drawings and as specified herein.
- D. Project Scope: See section 01100 Summary of Work.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including : General and Supplementary Conditions and other Division 1 Sections, apply to this Section.
- B. Related Sections include the following as well as associated appendices, schedules, and appendices to this section:
 - 1. Section 13510 – Computer System Hardware
 - 2. Section 13520 – Computer System Software
 - 3. Section 13530 – Programmable Logic Controllers
 - 4. Section 13540 – Radio Equipment
 - 5. Section 13550 – Software Control Block Descriptions
 - 6. Section 13561 – Panel Mounted Instruments
 - 7. Section 13566 – Miscellaneous Instruments
 - 8. Section 13570 – Panels and Appurtenances
 - 9. Section 13590 – Process Control Network Systems
 - 10. Section 13591 – Metallic and Fiber Optic Communication Cables and Connectors

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
- B. American Water Works Association (AWWA)
- C. International Society of Automation (ISA)
- D. National Electrical Manufacturers Association (NEMA)
- E. National Institute of Standards and Technology (NIST)
- F. Underwriters Laboratory (UL)

1.04 GENERAL

13500 – Instrumentation and Control System

- A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by the Engineer.
- B. General Equipment Stipulations
 - 1. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.
- C. Drawings
 - 1. The Drawings indicate locations and arrangements of equipment and may include installation details and block and one-line diagrams showing connections and interfaces with other equipment. The input/output (I/O) list are attached as an appendix to the Programmable Logic Controllers section.
 - 2. Principal components of the instrumentation systems shall be as indicated on the instrument device schedule drawings.
- D. Codes, Permits and Agency Approvals.
 - 1. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Where mandated by codes, panels, assemblies, materials, and equipment shall be listed by Underwriters' Laboratories. Contractor shall, as part of their work, arrange for and obtain all necessary permits, inspections, and approvals by the authorities having local jurisdiction of such work. This shall include any third-party inspections and testing of panels and equipment.
- E. Supplier's Qualifications
 - 1. Equipment and software furnished under this section and under other related sections listed in the Scope paragraph above shall be designed, coordinated, and supplied by a single manufacturer or supplier, hereinafter referred to as the I&C System Supplier or System Supplier. The System Supplier shall be regularly engaged in the business of supplying computer-based monitoring, control, and data acquisition systems. The Contractor shall utilize the services of the I&C System Supplier to coordinate all control system related items, to check-out and calibrate instruments, and to perform all testing, training, and startup activities specified to be provided.
 - 2. The following firms have been prequalified for this work and the Contractor shall select one firm from this list as the I&C System Supplier:

RE Pedrotti Company, Inc.
 5855 Beverly Ave, Suite A
 Mission, KS 66202
 913.677.3366

Integrated Controls, Inc. 15707 Mahaffie St. Olathe, KS 66062 913.782.9600
Durkin, Inc. 12951 Gravois Road, Suite 100 St. Louis, MO 63127 314.432.2040

System Suppliers not listed shall not be considered equal or acceptable to utilize on this project.

F. Coordination

1. Systems supplied under this section shall be designed and coordinated by System Supplier for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications, under other contracts, and, where applicable, with related existing equipment. All equipment shall be designed and installed in full conformity with the Drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, and the manufacturer of the related equipment.

G. Related Equipment and Materials

1. Related equipment and materials may include, but will not be limited to, instrumentation, motor controllers, valve actuators, chemical feeders, analytical measuring devices, conduit, cable, and piping as described in other sections or furnished under other contracts.

H. Device Tag Numbering System

1. All devices shall be provided with permanent identification tags. The tag numbers shall agree with System Supplier's equipment drawings and shall be as close as practical to the tag numbers used on the Drawings and device schedules. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device with self-tapping stainless steel screws where possible. Hand-lettered or tape labels will not be acceptable. Refer to the Equipment Identification and Tagging section bound elsewhere in these documents for additional Owner tagging requirements.

1.05 GENERAL REQUIREMENTS

- A. The Drawings and Specifications indicate the extent and general arrangement of the systems. If any departures from the Drawings or Specifications are deemed necessary by System Supplier, details of such departures and the reasons shall be submitted to Engineer for review with or before the first stage submittal. No departures shall be made without prior written acceptance.

- B. The specifications describe the minimum requirements for hardware and software. Where System Supplier's standard configuration includes additional items of equipment or software features not specifically described herein, such equipment or features shall be furnished as a part of the system and shall be warranted as specified herein.
- C. Governing Standards
 - 1. Equipment furnished under this section shall be designed, constructed, and tested in accordance with IEEE 519, ANSI C37.90, FCC Part 15 - Class A, and NEMA ICS-1-109.60.
- D. Dimensional Restrictions
 - 1. Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values. The System Supplier shall review the Drawings, the manufacturer's layout drawings and installation requirements, and make any modifications requisite for proper installation subject to acceptance by Engineer. At least three feet of clear access space shall be provided in front of all instrumentation and control system components.
- E. Workmanship and Materials
 - 1. System Supplier shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.
 - 2. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except for testing.
- F. Corrosive Fluids
 - 1. All parts which are exposed to corrosive conditions shall be made from corrosion resistant materials. System Supplier shall submit certification that the instrument manufacturer approves the selection of materials of primary elements that are in contact with the specified process fluid to be inert to the effects of the process fluid.
- G. Appurtenances
 - 1. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation devices shall be furnished as needed for proper performance of the equipment.
- H. Programming Devices
 - 1. A programming or system-configuring device shall be provided for systems that contain any equipment that requires such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be

complete, newly purchased for this project, and shall be in like-new condition when turned over to Owner at completion of start up.

1.06 SUBMITTALS

- A. Complete dimensional, assembly, and installation drawings, wiring and schematic diagrams; and details, specifications, and data covering the materials used and the parts, devices and accessories forming a part of the system furnished, shall be submitted in accordance with the Submittals section. Submittal data shall be grouped and submitted in three separate stages. The submittal for each stage shall be substantially complete. Individual drawings and data sheets submitted at random intervals will not be accepted for review. Equipment tag numbers or identifications used on the Drawings shall be referenced where applicable.
- B. First Stage Submittal
 - 1. The first stage submittal shall include the following items:
 - a. A detailed list of any exceptions, functional differences, or discrepancies between the system proposed by System Supplier and this specification.
 - b. Product catalog cut sheets on all hardware and software items, clearly marked to show the model number, optional features, and intended service of each device.
 - c. A brief, concise description of the proposed system, including major hardware and software components and personnel training.
 - d. A block diagram or schematic drawing showing the principal items of equipment furnished, including model numbers, and their interrelationships.
 - e. Drawings showing floor and wall space or desktop area requirements for all equipment items, including allowances for door swings and maintenance access.
 - f. Environmental and power requirements, including heat release information for each equipment item.
 - g. Standard field termination drawings for all process input/output equipment, showing typical terminations for each type of point available in the system.
 - h. A copy of the proposed software licenses for all software associated with the system.
 - i. Outline for training classes.
 - j. Submittals for factory and site acceptance testing procedures and forms; network testing procedures and forms; and qualifications for network subcontractor/installer and network engineer as defined in the associated Division 13 sections.
 - k. Overview schedule of programming development for site associated with this project. Schedule should show when programming will begin and the expected completion, acceptance testing, and commissioning.
 - l. Additional requirements defined in other Division 13 sections.

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- C. Second Stage Submittals
1. Before any equipment is released for shipment to the site and before factory testing is scheduled, the following data shall be submitted.
 2. At System Supplier's option, the first and second stage submittals may be combined. The second stage submittal shall include the following items:
 - a. The I&C System Supplier shall submit a modified version of the SCADA System Software Standards and Configurations document appended to this section. The System Supplier shall modify this document to detail software modules, functional descriptions of software furnished, and project specific configuration requirements for this project. The descriptions shall be identified with the applicable specification paragraph and P&ID drawing references.
 - (i) Standard system engineering and user manuals describing the use of the system and application programming techniques for creating reports, graphics, database, historical records, and adding new process I/O nodes to the system shall be included in the submitted version of the SCADA System Software Standards and Configurations document.
 - b. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Control panel drawings shall include the following at a minimum:
 - (i) Cover sheet with sheet index, project and contract information, and manufacturer.
 - (ii) Symbols of legends.
 - (iii) Front panel elevation drawing to scale. Front panel elevation drawings shall include overall dimensions, metal thickness, door swing, mounting details, weight, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices
 - (iv) Interior panel elevation drawn to scale.
 - (v) Bill of materials for front and interior panel elevation drawings.
 - (vi) Power distribution diagram/schematic.
 - (vii) Terminal strip drawings depicting all necessary field connections.
 - (viii) Control schematics.
 - (ix) Communication, network, and OIT devices showing connections, terminations, and wire labels.
 - c. Loop diagrams and installation drawings for all interconnecting wiring between components of the system and between related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections. If panel terminal designations, inter-device connections, device features and options, or other features are modified during the fabrication or factory testing,

revised drawings shall be submitted before shipment of the equipment to the site. Loop diagrams shall follow the ISA Standard 5.4 and include the following at a minimum:

- (i) Instrument symbols and tags: primary elements, transmitters, and signal conditioners.
 - (ii) Signal cable type, quantity of conductors, wire color and polarity.
 - (iii) Energy sources: electrical, air, or hydraulic fluid.
 - (iv) Voltage or pressure listed where required.
 - (v) Electrical power panel and circuit number.
 - (vi) Grounding and surge protection devices including signal isolation devices.
 - (vii) Control panel, junction box, intermediate termination cabinet labels.
 - (viii) Termination strip identification.
 - (ix) Individual termination numbers.
 - (x) PLC input/output rack, slot, and point designation.
 - (xi) Fail safe actions.
- d. Fiber termination diagrams to show all fiber terminations at fiber patch panels and final termination at equipment. Fiber termination diagrams shall show individual fiber type (single or multimode), number of fiber strands in the cable, detailed fiber fan out to patch panels, patch panel port numbers, fiber core/cladding dimensions, fiber colors, circuit identifications, and type of terminator.
 - e. Review of drawings submitted prior to the final determination of related equipment shall not relieve System Supplier from supplying systems in full compliance with the specific requirements of the related equipment.
 - f. Input/output listings showing point names, numbers, and addresses. Input/output identification numbers from the contract documents shall be cross-referenced in this submittal.
 - g. Proposed lesson plans or outlines for all training courses specified herein, including schedule, instructors' qualifications and experience, and recommended prerequisites.
 - h. Updated schedule showing programming development activities for each site associated with this project. schedule should show an update to the overview schedule depicting dates when programming was undertaken or will begin for each site and the expected completion, acceptance testing, and commissioning.
 - i. HMI and OIT graphic screens printed in color.
 - j. HMI database with any information required by the System Supplier highlighted.
 - k. Additional Requirements identified in other Division 13 sections.

D. Third Stage Submittal

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1. Complete system documentation, in the form of Operation and Maintenance Manuals, shall be submitted before the commencement of field acceptance testing. Operation and Maintenance Manuals shall include complete instruction books for each item of equipment and software furnished. Where instruction booklets cover more than one specific model or range of device, product data sheets shall be included which indicate the device model number and other special features. In addition to the required documents listed herein, O&M manuals shall include the following at a minimum:
 - a. Complete set of “as-built” loop diagram drawings, fiber termination diagrams, interconnection diagrams, and control panel drawings. If field-wiring modifications are made after these drawings are submitted, the affected drawings shall be revised and resubmitted.
 - b. Software manufacturer user manuals, programming guides, and references for HMI, PLC, Historian, OIT, operating system, and any other specialized software provided for the control system.
 - c. PLC and HMI application programming and configuration documentation including “objects” and “user-defined data types”.
 - d. Approved test reports for radio communications, fiber optic cable, and all other provided communications cabling.
 - e. Instrument calibration reports.
 - f. Hard and electronic copies of all provided software licenses and software configurations.
2. O&M manuals shall include the final version of the SCADA System Software Standards and Conventions document developed for this project.
3. The I&C System Supplier shall provide final loop drawings in their native AutoCAD format and in PDF form in the O&M submittal to the Owner.
4. Upon completion of all I&C System acceptance testing, the Contractor and I&C System Supplier shall provide O&M data for entry into the Owner’s Computerized Maintenance Management System (CMMS) by Owner. The I&C System Supplier shall coordinate with the Owner to obtain the necessary files and templates. The followed data shall be prepared at a minimum:
 - a. Machine reading assets and maintenance activities. Data shall be entered and provided in the Owner supplied template.
 - b. Asset information such as asset additions, asset updates, asset retirements including a rough estimated value, maintenance activities for assets, PID tags within the asset, and asset categorization. Data shall be entered and provided in the Owner supplied Microsoft Access Database template.
 - c. Contractor shall fill out the template documenting changes in the CMMS; insert asset additions including value, work order updates; non-destructive testing updates; and other asset fields. Assets shall be coordinated and categorized with the applicable Drawing tags for entry into Owner’s CMMS and Financial Software.

5. The final O&M shall be submitted to the Owner in both electronic form and three (3) hard copy binders. Refer to the Submittals and Operation Maintenance Data sections for format requirements.
6. Additional requirements identified in other Division 13 specification sections.

1.07 PREPARATION FOR SHIPMENT

- A. All electronic equipment and instruments shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements, shall be kept dry at all times, and shall not be exposed to adverse ambient conditions.
- B. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted surfaces that are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.
- C. Each shipment shall include an appropriate shipping list that indicates the contents of the package, including the specific instrument tags. The shipping list shall be accessible without exposing the instruments to the atmosphere. The shipping list shall also contain any cautionary notes regarding storage of the instruments, including requirements to protect the instrument from static discharge, desensitizing chemicals (solvents, paints, etc.), or ambient atmospheric conditions.
- D. Individual instruments shall be appropriately tagged or labeled to positively identify the device. All identification shall be visible without the need to unpack the instrument from its protective packaging.
- E. Instrument shipment and storage requirements shall be coordinated with Engineer or Owner prior to shipment. System Supplier shall provide adequate storage and be ready to accept the shipment before shipping any equipment to the site. Additional shipping and storage requirements shall be as detailed in the individual instrument specifications.
- F. Components which are shipped loose due to transportation limitations shall be assembled and disassembled by the manufacturer prior to shipment to assure that all components fit together and are adequately supported.

1.08 DELIVERY, STORAGE, AND SHIPPING

- A. Shipping, handling, and storage shall be in accordance with the Product Delivery Storage and Handling section.

1.09 SPARE PARTS

- A. Spare parts and consumable items are specified in the respective Division 13 sections.
- B. Packaging

1. All spare parts shall be delivered to Owner before final acceptance of the system. Packaging of spare parts shall provide protection against dust and moisture and shall be suitable for storage. Circuit boards and other electronic parts shall be enclosed in anti-static material. All packages shall be clearly marked with the manufacturer's name, part number or other identification, date of manufacture, and approximate shelf life.
- C. Replacement
1. System Supplier may utilize spare parts and supplies during system installation, de-bugging, startup, or training, but shall restore all such materials and supplies to the specified quantities before final acceptance of the systems.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All equipment furnished under each section referenced in the scope paragraphs above is a part of this section and shall be selected by System Supplier for its superior quality and intended performance. Equipment and materials used shall be subject to review.
- B. Standard Products
 1. The systems furnished shall be standard products. Where two or more units of the same type of equipment are supplied, they shall be the products of the same manufacturer; however, all components of the systems furnished hereunder need not be the products of one manufacturer unless specified herein.
 2. To the extent possible, instruments used for similar types of functions and services shall be of the same brand and model line. Similar components of different instruments shall be the products of the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

- A. The design of the systems furnished hereunder shall utilize concepts, techniques and features that provide maximum reliability and ease of maintenance and repair. The systems shall include board-level devices such as light emitting diodes or other indicators to facilitate quick diagnosis and repair. Diagnostic software shall be furnished to facilitate system-level troubleshooting.
- B. Where redundant hardware is provided, the system shall be capable of performing all specified functions, without reconfiguring hardware or software, with only one device of each category in service.
- C. Factory Assembly

1. Equipment shall be shipped completely factory assembled, except where its physical size, arrangement, configuration, or shipping and handling limitations make the shipment of completely assembled units impracticable.

D. Expandability

1. The system shall be capable of expansion as follows:

Future Requirement	Quantity
PLC	50%
I/O modules	30%
I/O field terminal blocks	30%
Operator Work Stations	50%
PLC Communication Modules	50%
Ethernet Switch ports	20%
Fiber Patch Panel Capacity	50%

2.03 POWER SUPPLY AND INSTRUMENT SIGNAL

- A. Power supply to all control system equipment will be 120 volts, 60 Hz, single phase. System Supplier shall be responsible for distribution of power among enclosures, consoles, peripherals, and other components of the system from the power supply receptacles and junction boxes indicated on the Drawings. Power distribution hardware shall include cables and branch circuit overcurrent protection installed in accordance with the electrical section.
- B. Unless otherwise indicated, power supply to the instrumentation will be unregulated 120 volts ac. Unless otherwise indicated, all transmitted electronic analog instrument signals shall be 4-20 mA dc and shall be linear with the measured variable.
- C. Facility Distribution System
 1. Equipment not indicated to be powered from an uninterruptible power source shall be suitable for being supplied from the facility distribution system and shall be capable of withstanding voltage variations of ± 10 percent and harmonics up to the limits of IEEE 519 without affecting operation. System Supplier shall provide voltage conditioning or filtering equipment if necessary to meet the requirements specified.
- D. Power Supplies
 1. Power supplies for voltages other than those listed above shall be an integral part of the equipment furnished. Internal power supplies shall be regulated, current limiting, and self-protected.
- E. Surge Withstand
 1. All equipment shall meet all surge withstand capability tests as defined in ANSI C37.90 without damage to the equipment.
- F. Uninterruptible Power Supply
 1. An uninterruptible power supply (UPS) shall be furnished hereunder to power the equipment indicated on the Drawings or will be furnished under another

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section. System Supplier shall be responsible for coordinating the size of the UPS unit with the equipment furnished hereunder, and shall advise Engineer if a unit of higher capacity is necessary.

2.04 SERVICE CONDITIONS AND ENVIRONMENTAL REQUIREMENTS

- A. The equipment provided for the instrumentation and control system shall be suitable for the service conditions specified in the attached equipment sections.
- B. All equipment shall be designed and selected to operate without degradation in performance throughout the environmental extremes specified. Equipment shall be designed to prevent the generation of electromagnetic and radio frequency interference and shall be in compliance with FCC Rules and Regulations, Part 15, for Class A computing devices.
- C. Ambient Temperature and Elevation
 - 1. All system equipment located in air conditioned rooms shall be suitable for operation in ambient temperatures from 10°C to 35°C and a relative humidity of 10 to 80 percent, noncondensing. All equipment located in non air conditioned indoor areas shall be suitable for an ambient temperature range of 0°C to 50°C and a relative humidity of 10 to 95 percent, noncondensing. All equipment located outdoors shall be suitable for operation in an ambient temperature range -20°C to 60°C and a relative humidity of 5 to 100 percent. Heaters and air conditioning/cooling equipment shall be provided where essential to maintain equipment within its manufacturer-recommended operating ranges.
 - 2. All equipment and instruments shall be designed to operate at the site elevation from 730 to 1100 feet AMSL.
- D. Deleterious Effects
 - 1. All system equipment will be installed in areas without anti-static floor construction and without any provisions for control of particulates or corrosive gases other than ordinary office-type HVAC filtering. System Supplier shall furnish any additional air cleaning equipment, anti-static chair pads, or other protective measures necessary for proper operation of the system.
 - 2. All input/output hardware shall meet or exceed, without false operation, all requirements of NEMA ICS-1-109.60, Electrical Noise Tests.
- E. Noise Level
 - 1. The equivalent "A" weighted sound level for any system equipment located in the control room, except printers, shall not exceed 35 dBA. The sound level for printers shall not exceed 65 dBA. Sound reduction enclosures shall be provided where necessary to comply with these limits.
- F. Lightning Protection
 - 1. In addition to other environmental protection specified herein, the entire system shall be provided with lightning protection. Lightning protection measures shall include the following:

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2. Grounding
 - a. All major components of the system shall have a low resistance ground connection. Grounding system provisions indicated on the Drawings shall be modified as recommended by System Supplier.
3. Surge Suppressors
 - a. Surge and lightning suppressors shall be non-faulting, non-interrupting, and shall protect against line-to-line and line-to-ground surges. Devices shall be solid-state metal oxide varistor (MOV) type, silicon junction type, Gas Discharge Tube (GDT) type, or some combination of these types, with a response time of less than 50 nanoseconds. Surge protective devices shall be applied for the following:
 - (i) All 120 VAC power connections to PLCs, instruments, and control room equipment. Surge arrestors shall be Transtector "SPD I2R Series", Phoenix Contact "PLT-SEC Series", MCG Surge Protection "400 Series" or equal.
 - (ii) All connections to coaxial-based networked equipment (including CCTV and CATV) where any part of the circuit is outside of the building envelope. Surge arrestors shall be Transtector CCTV-PTZ Series", Phoenix Contact "CoaxTrab Series", or equal.
 - (iii) All analog signal circuits where any part of the circuit is outside of the building envelope. Circuits shall be protected at both the transmitter and the control system end of the circuit. Surge protection devices shall not impede or interfere with the use of smart transmitter calibration/communication.
 1. Protection devices located at the field transmitter shall be:
 - i. Loop Powered Transmitters - Eaton MTL "TP48", Phoenix Contact "SurgeTrab Series", Transtector "PDS Outdoor Series" or equal.
 - ii. Four-Wire Transmitters – Phoenix Contact "BoxTrab Series", Schneider Electric ASCO Model 265, Emerson "SolaHD STC-SLAC Series", or equal.
 2. Protection devices in control panels shall be Transtector "I2R IEP Series", Eaton MTL "SD Modular Series", Phoenix Contact "TTC-6P Series", or equal.
 - (iv) All metallic pair (twisted and untwisted) conductor local area network and data highway termination points, where any part of the data highway cable is routed outside of the building envelope. Single-port protective devices shall be Phoenix Contact "DataTrab Series", Transtector "FSP" Series", Citel "MJ8 Series", Eaton MTL "NP Series", or equal.
 - (v) All serial, PLC data highway, and remote I/O network termination points where any part of the circuit is routed outside of the building

envelope. Surge protection devices shall be Transtector “DRDC Series” (RS-232); Transtector “FSP Series” (RS-422), Phoenix Contact “TTC-6P Series”, Citel “E280 Series”, or equal.

(vi) All radio antenna leads. Surge protection devices shall be as specified in Multiple Address Radio Equipment section.

2.05 SOFTWARE DOCUMENTATION

- A. System Supplier shall furnish complete documentation on all software supplied with the systems specified herein. Operating systems, compilers, assemblers, and utility and diagnostic programs that are standard commercial products of third parties need not be included in the optical media backup. Software documentation shall consist of the following principal items:
1. One backup set of any integrated circuit or solid-state memory-based plug-in firmware used.
 2. Two complete back-up copies of system and application software in executable format on physical digital storage media compatible with the system furnished.
 3. Three sets of user reference manuals for all standard system and application software.
 4. One set of user reference manuals for all operating system software.
 5. Three sets of printed as-built reference documentation for any special software provided specifically for this contract.
 6. For each licensed software product, all documentation provided by the product manufacturer shall be provided. This includes all reference manuals and any other documents that were provided by the manufacturer. One set of this documentation shall be supplied for each and every piece of equipment provided. Multiple pieces of similar equipment or software require multiple copies of this documentation.

2.06 SOFTWARE LICENSE

- A. All software programs supplied as a standard part of System Supplier’s products for this project shall be licensed to Owner for use on the system specified herein. Such license shall not restrict Owner from using the software on the system provided hereunder or its replacement. Owner shall have the right to make copies of the software for use on the system provided. Specific requirements of System Supplier’s software license are subject to review and approval by Owner and Engineer.

2.07 INSTALLATION TEST EQUIPMENT

- A. All necessary testing equipment for calibration and checking of system components shall be provided by System Supplier. System Supplier shall also

furnish calibration and maintenance records for all testing and calibration equipment used on the site if requested by Engineer.

PART 3 – EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. The installation of equipment furnished hereunder shall be by the Contractor or their assigned subcontractors.
- B. Fiber connections to the SCADA network ring will involve disrupting the existing fiber connection between facilities. Contactor shall plan for and coordinate disruptions to the SCADA network ring with the Owner. Contractor shall also test communication and verify communications between the new connection and adjoining facilities before making the next connection to the SCADA network ring.
- C. Field Wiring
 - 1. Field wiring materials and installation shall be in accordance with the electrical section.
- D. Instrument Installation
 - 1. Instruments shall be mounted so that they can be easily read and serviced and so that all appurtenant devices can be easily operated. Installation details for some instruments are indicated on the Drawings.
 - 2. All outdoor instrumentation shall be protected from direct sun exposure. Instruments shall be placed in locations to limit south and west sun exposure. Sunshades shall be provided on instruments that are subject to the direct sun exposure. Sunshades shall be located so the opening faces north or east where possible. Sunshades shall be provided as shown on the Drawings.
- E. Salvage of Existing Equipment
 - 1. Existing equipment and materials removed or replaced under this contract shall be delivered to Owner at a location designated by Owner or shall be properly disposed of at Owner's discretion. Care shall be taken to avoid damage to equipment delivered to Owner.
 - 2. Any mounting brackets, enclosures, stilling wells, piping, conduits, wiring, or openings that remain after removal of equipment and support hardware shall be removed or repaired in a manner acceptable to Owner and Engineer. Transmitters or switches containing mercury shall be removed and disposed of by personnel trained in the handling of hazardous materials and using approved procedures.

3.02 SYSTEM SOFTWARE CONFIGURATION

- A. The system software shall be configured by the System Supplier. Configuration services shall consist of the creation of the system database, report formats, operator interface graphic and tabular display screen formats, password and

security implementation, and programming of control units to provide a fully functioning system. The System Supplier shall fully configure the system using data provided herein or supplied by the Engineer and/or the Owner after award of the contract. As described herein, the I&C System Supplier shall submit a modified version of the SCADA System Software Standards and Conventions document appended to this section and detail the specific configuration requirements for this project.

- B. The system that is delivered to the field for installation, checkout, and startup shall have all files, or databases, that are configurable in size, sized in a manner in which there will be 50% space available for future work after the completion of this project. This sizing should include the addition of memory modules, disk drives, or any other device to insure the 50% spare space availability. All "tuning" of software that is dependent on space requirements shall be done prior to the completion of this project.
- C. Tuning of software programs shall be accomplished in such a manner that the program operates at its highest performance level. These programs include, but are not limited to Microsoft SQL Server, all PLC ladder logic, and others.
- D. Control System Database
 - 1. The control system database shall be developed and configured by the System Supplier. The System Supplier shall enter information obtainable from the Contract Documents into the database prior to soliciting input from the Engineer and the Owner. The System Supplier shall determine the need for any "pseudo" database points and shall ascertain and enter all information needed to define these points. The System Supplier is responsible for entering all information associated with each point. This includes but is not limited to, descriptions, engineering units, associated displays, areas, security, etc. All fields associated with each database point must be completely filled out accurately.
- E. Graphic Screen Displays
 - 1. The System Supplier shall be responsible for developing and configuring the custom graphic displays. Each piece of major process equipment that is monitored by the control system shall be displayed on one or more graphic screen. Graphic screens shall be representations of the equipment and piping. The screens must accurately show all devices and equipment that is part of the control loops. These items must be done in accordance to the modified version of the SCADA System Software Standards and Conventions document appended to this section. Alarm and/or event displays shall also be provided and proven functional prior to acceptance of the system. A means of capturing and printing of all graphic screens shall also be included. The software program provided must be capable of printing the screen in a black and white (using gray scale) or color format. This program must be accessible from all terminals provided under this contract. The black and white printing

shall be done in a manner in which the use of the black background is not represented in the printout. This is done to keep the utilization of ink cartridge and toner cartridge to a minimum.

2. All graphic screens shall be animated to indicate the current state of the piece of equipment. The following graphic screens shall be provided, as a minimum:

a. Modification to Existing Graphic Displays

(i) North Pump Stations and WWTP Overview additions to include:

1. Facility 619, North Church Estate Sanitary Station
2. Facility 623, Pied Creek Sanitary Station
3. Facility 631, First Creek Sanitary Station
4. Facility 632, Second Creek Sanitary Station
5. Facility 642, Wildwood West Sanitary Station
6. Facility 643, KCI Industrial Sanitary Station
7. Facility 646, Briarcliff West Sanitary Station
8. Facility 657, Northland Mobile Sanitary Station
9. Facility 659, Chouteau Sanitary Station
10. Facility 662, Riverside Horizons Sanitary Station
11. Facility 676, South Airport Sanitary Station
12. Facility 682, Lake Waukomis Sanitary Station
13. Facility 684, White Aloe Sanitary Station
14. Facility 687, Upper Rush Sanitary Station
15. Facility 688, Harlem Sanitary Station
16. Facility 693, Birmingham Sanitary Station
17. Facility 694, Mace Road Sanitary Station
18. Facility 696, Weatherby Lake Sanitary Station
19. Facility 697, Platte Woods Sanitary Station
20. Facility 711, Birmingham WWTP
21. Facility 745, KCI De-Icing Sanitary Station

(ii) North Pump Stations and WWTP Key Performance Indicators (KPI):
Updated to include the facilities listed above.

(iii) South Pump Stations and WWTP Overview additions to include:

1. Facility 600, Southwest Boulevard Sanitary Station
2. Facility 601, 25th Street Sanitary Station
3. Facility 663, Birchwood Sanitary Station
4. Facility 664, Gregory Ridge Sanitary Station
5. Facility 667, 12th Street Sanitary Station
6. Facility 677, 118th & Lawndale Sanitary Station
7. Facility 686, Brush Creek Sanitary Station
8. Facility 692, 83rd Street Sanitary Station

(iv) South Pump Stations and WWTP KPIs: Updated to include the facilities listed above.

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- b. New Graphic Screens
 - (i) Flood Stations Overview
 - (ii) Individual Flood Pump Station Screens to include:
 - 1. Facility 603, Broadway Flood Station
 - 2. Facility 604, North Airport Flood Station
 - 3. Facility 606, Gillis Flood Station
 - 4. Facility 607, Lydia Flood Station
 - 5. Facility 608, Prospect Flood Station
 - 6. Facility 609, Milwaukee Flood Station
 - 7. Facility 610, Truman Flood Station
 - 8. Facility 611, Hawthorn Flood Station
 - 9. Facility 612, Blue Bank Flood Station
 - 10. Facility 614, South Airport Flood Station
 - 11. Facility 637, South Airport Relief Flood Station
 - 12. Facility 699, Kemper Flood Station
 - (iii) Flood Stations KPIs: Include KPIs from facilities listed above.
 - c. Alarm Summary – update for new facilities
 - d. Event Summary – update for new facilities
 - e. A minimum of 5 custom graphic displays shall be provided by the System Supplier.
- F. Report Formats
- 1. Report formats shall be developed and programmed by the System Supplier using tag names defined in the database creation. Reports shall be provided as summarized below. All reports will be provided with a header on each page to indicate the contents of each column of information. Each page shall be numbered and indicate the name of the report, the date the report was printed, and the time of the printout. The printout shall also include the time span of the information shown on the report.
 - a. Daily Operating Report
 - (i) A daily report, listing the major plant variables (up to 50 variables) shall be provided. The report shall include hourly values and minimum/maximum/average values where appropriate. A minimum of 10 separate daily reports shall be provided by the System Supplier.
 - b. Monthly Operating Report
 - (i) A monthly operating report, which averages values from the above daily reports, shall be provided. The report shall include the monthly minimum/maximum/average values where appropriate.
 - c. Five custom reports (up to 50 variables each)
- G. Configuration Standards and Conventions
- 1. A modified version of the SCADA System Software Standards and Conventions document appended to this section shall be prepared and submitted by the System Supplier. The document shall be submitted for

review and approval before software configuration commences. The document shall be modified to describe; how items will be selected for control; methods for navigation between displays; address usage/naming conventions; and security setup specific to this project. Before submitting the initial draft document, the System Supplier shall meet with the Engineer and/or Owner to review any of the Owner's existing standards and conventions. All copies of this submittal shall be provided in color to ensure the accuracy of each item. No black and white copies will be accepted. The colors used in the printed submittal shall accurately depict the colors and shapes proposed for use on the final system.

2. In addition to submitting the document for review, an updated version of the document shall be submitted as part of the O&M Manuals. The document shall be revised to document any additional standards that are established throughout the configuration process.

H. Configuration Review Meetings

1. Proposed graphic screens and report formats shall be reviewed with the Owner and Engineer throughout the configuration process. The System Supplier's programming personnel shall attend all meetings. A second review meeting shall be held at approximately 50 percent completion. Both meetings shall be held at the Owner's facilities.

I. Software Functional Requirements

1. General functional requirements for system configuration are indicated on the Drawings and described in the specifications. The information presented herein and indicated on the Drawings illustrates the general functional intent of the system and may not be sufficient to fully configure the system. The System Supplier shall be responsible for determining what additional information may be required to complete the configuration tasks, and for obtaining this information from the Engineer or the Owner.

3.03 SYSTEMS CHECK

- A. System Supplier shall provide the services of a field manager and a trained and experienced field supervisor to assist the installation Contractor during installation, and the calibrate, test, and advise others of the procedures for installation, adjustment, and operation.
- B. Field Manager
 1. System Supplier shall appoint a field services manager who shall be responsible for the coordination of all system check-out and startup activities, and who shall be immediately available to Engineer and Owner by phone or on site for the duration of this project.
- C. Test Personnel
 1. In addition to the Field Manager, the I&C System Supplier shall provide qualified control system programmer(s)/engineer(s) and other required technical personnel to perform all calibration, testing, and verification. The

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test personnel are required to be familiar with this Project and the equipment, software, and systems before being assigned to the test program.

- D. Field Inspection at Delivery
 - 1. The field supervisor shall inspect major equipment items within five working days of delivery, to assure that the equipment was not damaged during shipment and shall supervise or assist with unpacking, initial placement, and initial wiring of the system.
- E. Field Calibration of Instruments
 - 1. After each instrument has been installed, a technical representative of System Supplier shall calibrate each instrument and shall provide a written Installation and Calibration checklist for each instrument, indicating the results and final settings. The adjustments of calibrated instruments shall be sealed or marked, insofar as possible, to discourage tampering. Instrument calibration shall be done before checkout of the system operation. Typical checklists are attached to the end of this section.
- F. Training for Installation Personnel
 - 1. The field supervisor shall train the installation personnel in reading and understanding submittal drawings, and in the correct installation and wiring procedures for the equipment. A minimum of one day shall be included for this training.
- G. Field Inspection Prior to Start Up
 - 1. After installation and wiring connections are complete, the field supervisor, with additional System Supplier's personnel shall verify that each external connection to the system is correctly wired and field process components and devices are functioning as intended. A minimum of twenty-five working days shall be included for this task, but System Supplier shall be responsible for completing the following scope of work.
 - a. Analog Signals
 - (i) Analog input signals shall be simulated at the transmitting source, and verified to be received at the proper register address in the control system. Analog outputs shall be generated at the control system, and verified to be received with the correct polarity, at the respective receiving device.
 - b. Discrete Signals
 - (i) Discrete input and output signals shall be simulated and verified that they are received at the respective receiving device, and at the proper voltage.
 - c. Devices by Other Suppliers
 - (i) If interrelated devices furnished by other suppliers, under other contracts, or by Owner, such as valve actuators, motor controls, chemical feeders, and instruments, do not perform properly at the time of system checkout, the field supervisor shall use suitable test

equipment to introduce simulated signals to and/or measure signals from these devices to locate the sources of trouble or malfunction.

d. System Checkout Report

- (i) The System Supplier shall submit a written report on the results of such tests to Engineer. Additional documentation shall be furnished as requested by Engineer to establish responsibility for corrective measures. System Supplier shall verify, in writing, to Engineer or Owner that System Supplier has successfully completed the external connection check before beginning system startup or field acceptance testing.

H. Start Up Assistance

1. After the field supervisor has completed the system check and submitted his report, System Supplier shall supply a factory-trained engineer and programmer to provide on-site start up assistance. During the startup period, these personnel shall thoroughly check all equipment, correct any deficiencies, and verify the proper operation of all components. Ninety working days shall be included for this task.

I. Example Test Forms

1. Example test forms are attached as an appendix to this section. The I&C System Supplier shall utilize the appended forms as a starting point for the development of project-specific test forms.
2. The example test forms are not intended to be complete or comprehensive. The I&C System Supplier shall edit and supplement the forms to meet the requirements for testing and test forms in this section and other Contract Documents.

3.04 TESTING

A. Correction of Deficiencies

1. Any deficiencies observed during testing shall be corrected and retested before the completion of any test.
 - a. Any changes and/or corrections shall be noted on the test forms and documentation. The Owner shall witness the revisions and/or corrections prior to leaving the test site.
 - b. If the corrections and/or revisions are too extensive to perform while the Owner is scheduled to be at the test site, the test shall be, at the Owner or Engineer's discretion, considered failed, and the test shall be restarted at a later date. All costs for the re-test shall be borne by the I&C System Supplier, including Owner's travel expenses.

- B. Testing shall be conducted as a series of unwitnessed and witnessed tests which progressively demonstrate that the component subsystems as well as the overall Computer Control System at each facility conforms to the specifications. Testing shall involve the System Supplier, Contractor, Engineer, and/or Owner. System testing shall include the following major testing activities:

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1. Preliminary Factory Testing
 - a. Initial I/O Point Checkout
 - b. Pre-Factory Demonstration Testing
 2. Factory Demonstration Test (FDT)
 3. Preliminary Field Testing (multi-stage tests)
 4. Site Demonstration Test (SDT)
 5. Site Acceptance Test (SAT)
- C. The system shall be acceptance tested at the System Supplier's factory and on site.
- D. System Supplier shall prepare a testing procedure to be approved by Owner and/or Engineer that shall demonstrate that the system conforms to the specifications. The testing procedure shall be submitted to the Owner and Engineer at least 6 weeks in advance of factory testing. The testing shall be conducted by System Supplier and witnessed by Owner and/or Engineer.
- E. System Supplier shall notify Owner and/or Engineer in writing at least 14 days before the proposed testing date. If the factory demonstration test is concluded unsuccessfully, the test shall be repeated. System Supplier shall reimburse Owner and/or Engineer for all expenses incurred in connection with attending repeated factory or site testing necessitated by system failure or inadequate preparation.
- F. If any testing requires shutdown of automated controls at an operational facility for any pump or other treatment process, the Contractor shall submit an Operational Change Control Plan for review and approval by the Owner and Engineer. See Operational Change Control Plan section for additional information.
- G. System Test Plan
1. System Supplier shall prepare a System Test Plan to describe the overall process to be used for system testing. The plan shall provide an overview of each test activity, both unwitnessed and witnessed, as well as a preliminary schedule. The plan shall include a detailed list of all equipment which will be staged for the Factory Demonstration Test. The plan shall also include a description of all test equipment, simulation hardware and software, and other devices which will be used to simulate field conditions and system loading for factory testing. Sample test procedures which illustrate the level of detail to be provided as part of the FDT and SDT Test Procedures shall be included in the System Test Plan. The test plan shall also provide a preliminary description of planned phasing for field testing. The System Test Plan shall be submitted as part of the First Stage submittal package.
- H. System Test Procedures
1. Comprehensive Test Procedures shall be prepared for both the Factory Demonstration Test (FDT) and the Site Demonstration Test (SDT). The test procedures shall contain detailed test sequences designed to demonstrate each

system function defined by the specifications. Each test sequence shall contain the following information:

- a. Description of function to be demonstrated, including specification reference.
 - b. Description of hardware/software setup including any test equipment and/or simulation software to be used for FDT.
 - c. Description of approach to be used to demonstrate alarm and failure conditions and other abnormal process conditions during SDT.
 - d. Step-by-step description of test, including specific data points, values, etc. to be used.
 - e. Expected results for each test step along with space to record actual results.
 - f. Space to describe any errors or deficiencies witnessed during test sequence.
 - g. Listing of testing equipment that will be used including serial numbers, NIST-traceable calibration, and how the testing equipment will be used.
 - h. Descriptions of the expected role of the Owner and the Engineer, as well as any requirements for assistance from Owner's staff.
 - i. Signature blocks for Owner's Representative and System Supplier.
 - j. Forms and checklists to be used. Sample test checklists are attached as an appendix to this section and shall be modified by the System Supplier to add specific requirements for this project.
2. System Supplier shall submit Test Procedures for review and approval by the Owner and/or Engineer at least 60 days prior to the anticipated start of the associated test.
- I. Preliminary Factory Testing
 1. System Supplier shall be responsible for conducting an ongoing testing process during system development and staging to ensure that the system hardware and software components meet the functional requirements defined by the specifications. Hardware simulators that contain switches, pilot lights, variable analog signal generators, and analog signal level displays, which shall be connected to the I/O points within the SCADA system. In addition to hardware simulators, simulation software and test equipment shall be used appropriately to simulate process conditions. Preliminary testing will normally be unwitnessed; however, Owner reserves the right to have Owner staff [and/or Engineer] witness portions of the preliminary testing.
 - J. Initial I/O Point Checkout
 1. System Supplier shall perform a complete, end-to-end checkout for every I/O point from the field termination assembly to HMI graphic display. The I/O Point Checkout shall be conducted on all PLCs. System Supplier shall test every input and output point for proper operation, including wired spares. Test signals shall be injected to verify the operation of each Analog Input (AI)

- and Discrete Input (DI). Each Analog Output (AO) and Discrete Output (DO) shall be also tested for proper operation.
2. System Supplier shall develop a Point Checkout Form for each I/O point. The checkout form shall include the point tag, descriptor, all checks performed for the point, date and time of the check, and a signoff block for the System Supplier's representative. The completed I/O Checkout forms for all points shall be submitted for Owner and/or Engineer review prior to scheduling the FDT.
 3. The following items shall be checked for each I/O point:
 - a. For each analog input point:
 - (i) Value at 0%, 25%, 50%, & 100% of full scale
 - (ii) High High, High, Low, Low Low Alarm Limits
 - (iii) Alarm Deadband
 - b. For each analog output point:
 - (i) Milliamp reading at 0%, 25%, 50%, & 100% of full scale.
 - c. For each discrete input point:
 - (i) Status Points – Proper Indication
 - (ii) Alarm Points – Proper Alarm Notifications
 - d. For each discrete output:
 - (i) Proper Operation (latching or momentary)
- K. Pre-Factory Demonstration Testing
1. System Supplier shall be responsible for staging the equipment required for the Factory Demonstration Test (FDT) in a neat and orderly manner in an environmentally conditioned location approved by Owner and/or Engineer. Prior to scheduling the FDT, System Supplier shall have successfully completed at least one dry run using the approved test procedures. At least 14 days prior to the requested start date, System Supplier shall submit a written request for scheduling the FDT. This written request shall include a certification by the System Supplier Project Manager that the FDT dry run has been completed.
- L. Factory Demonstration Test (FDT)
1. After system assembly and completion of preliminary testing, System Supplier shall conduct a comprehensive Factory Demonstration Test. The FDT will be conducted in two stages: Stage 1 FDT is to validate the construction and operation of the hardware and basic software prior to Stage 2 of the FDT when the downloading and installation of the custom programming of the System Supplier shall be made.
 2. Panel Inspections
 - a. The Owner, Engineer, and I&C System Supplier will inspect each control panel completeness, workmanship, fit and finish, and compliance with the Contract Documents and the accepted submittal drawings.

- b. The I&C System Supplier shall provide inspection forms as part of the first stage I&C submittal.
 - c. The panel inspections shall include at a minimum:
 - (i) Layout
 - (ii) Mounting
 - (iii) Wire and data cable routing
 - (iv) Wire tags
 - (v) Power Supply
 - (vi) Components and Wiring
 - (vii) I/O components layout (including terminals, wiring and relays)
 - (viii) Device layout on panel doors
 - (ix) Proper ventilation operation
3. Stage 1 Factory Demonstration Test
- a. The following equipment shall be available and staged for the factory test. Equipment that is provided by bid allowance, although listed below, shall be staged at the factory test per the Engineer's direction. Where necessary, the System Supplier shall simulate existing equipment required to test the equipment provided at the Engineer's direction.
 - (i) A copy of the existing Computer Control System application to simulate existing connections and servers (I/O, Terminal, Historical, etc.)
 - (ii) One Operator Workstation running installed Client.
 - (iii) All Programming Laptops with all software installed.
 - (iv) All PLCs and OITs provided by the System Supplier. These PLCs shall be fully constructed and installed in panels or on subpanels, ready for mounting in panels.
 - (v) All SCADA HMI and PLC network switches and firewalls.
 - (vi) Communications cables, including fiber optics and media converters as required.
 - (vii) One report printer with interconnecting cables.
 - b. Using the approved FDT Procedures, the system, including all peripherals and associated software, shall be factory tested under simulated operating conditions. All basic functions of the Computer Control system Software shall be demonstrated, including I/O processing, communications, alarm handling, basic HMI display functions, alarm logging, report generation, and historical data storage, as well as any specific functions listed herein. The test results shall be observed on the HMI displays, printed for hard copy, and recorded in the test procedure document. Specific testing requirements are described below.
 - c. Daily schedule for testing: System Supplier shall begin each day of witnessed testing by meeting with the Owner and/or Engineer . The

purpose of this meeting is to review the test results from the previous day and to preview the testing for the current day.

- d. System Supplier shall make two sets of the following documentation available for use by the Engineer [and Owner] during the FDT:
 - (i) All drawings, specifications, addenda and change-orders
 - (ii) FDT Procedures
 - (iii) Approved shop drawings and hardware submittals for equipment being tested.
 - (iv) Preliminary O&M Manuals.
- e. Hardware Testing
 - (i) Prior to beginning the test, all system components shall be inventoried. System Supplier shall prepare a System Configuration Inventory List which contains each separate system component including manufacturer, model and part number, description, and serial number. This list shall be annotated to reflect the status of all system components at the time of FDT. System Supplier shall maintain the System Configuration Inventory List until Final Acceptance. The Inventory List shall be updated to reflect any equipment replacement or substitutions.
 - (ii) A physical inspection shall be conducted for all hardware devices to assess structural integrity and component layout. As a minimum, the following items shall be inspected and verified:
 - 1. Sub-panel mounting
 - 2. Enclosure frame structure
 - 3. Paint work and finish
 - 4. Dimensions
 - 5. I/O Subsystem physical layout
 - 6. Power supply mounting
 - 7. Power cable routing
 - 8. Data cable routing
 - 9. Wiring runs across hinges
 - 10. Fans and blower clearances
 - 11. UPS installation
 - (iii) Processors, processor modules, and peripheral devices associated with the system shall be assembled together as they will be installed in the field and shall be tested. The test shall demonstrate proper operation of each hardware device and communications among devices, and shall include verification of selected analog and discrete inputs and outputs. All standard hardware diagnostic programs shall also be demonstrated.
- f. HMI Software Functionality

- (i) The HMI Software Functionality tests shall verify basic features and functions of the HMI System. Test simulations shall be used to test system functions if hardware or instrumentation equipment is not available. The functional tests shall include, but not be limited to, the following demonstrations:
 - 1. Device and system power failure/restart
 - 2. Simulation of PLC and network communication error conditions and handling
 - 3. HMI Server failure and automatic failover
 - 4. Verify that system meets or exceeds the performance requirements defined in this section
 - 5. Verify the accuracy of hardware and software documentation
- g. PLC Software Functionality
 - (i) The System Supplier shall demonstrate all programs installed in the PLC(s) include the following:
 - 1. Power-Fail and restart logic.
 - 2. PLC failover and redundancy (if applicable)
 - 3. PLC program uploading and downloading
 - 4. Network diagnostics
 - 5. Alarm generation and acknowledgement
 - 6. Alarm inhibit
 - 7. Peer-to-peer communications
 - 8. OIT communications and functionality of all OIT displays and commands
- h. Network Testing
 - (i) All network components shall be configured as closely as possible to the final configuration; however, use of a temporary backbone fiber is acceptable. The following functions shall be demonstrated:
 - 1. IP addressing scheme verification
 - 2. Network failover/redundancy
 - 3. Network separation verification
 - 4. Communication failure alarms
 - 5. Network performance tests to prove that the network is operating at stated speeds (e.g. gigabit fiber loop).
 - 6. Demonstrate the proper operation of all digital communication links and networks.
- i. Computer Hardware and Software Testing
 - (i) Demonstrate all utility software and functions, such as virus protection, backup, optical drive burning, remote updates, network monitoring, etc.
 - (ii) Demonstrate the proper operation of all peripheral hardware.
 - (iii) Demonstrate all general functions.

- (iv) Demonstrate proper operation of log-on and other access security functions.
- (v) Demonstrate the proper operation of all historical data storage, trend, display, backup, and report functions.
- (vi) Test automatic fail over of redundant equipment.
- j. Redundancy/Failover Testing
 - (i) Failover and recovery for all redundant components shall be demonstrated.
 - (ii) Special effort shall be made to demonstrate how the system responds to and recovers from abnormal conditions including, but not limited to: equipment failure, operator error, communication subsystem error, communications failures, simulated/forced software lockups, power failure (both utility power and power to SCADA hardware), process equipment failure, and high system loading conditions, as well as concurrent instances of failures.
- 4. Stage 2 Factory Demonstration Test
 - a. At the completion of Stage 1 Factory Demonstration Test, the System Supplier shall install their custom developed HMI and PLC program into the Computer Control System and the following testing shall be conducted.
 - b. HMI Graphic Displays and Reports Functionality.
 - (i) System Supplier shall provide an inventory of all required HMI graphic displays and reports. The test procedures shall verify all features and functions of all HMI graphic displays and reports, in accordance with the specifications and the Software Configuration Standards and Conventions document.
 - c. PLC Software Functionality
 - (i) System Supplier shall demonstrate all programs installed in the PLC(s) including the following:
 - 1. Correct operation when switching between control modes for each device.
 - 2. Calculation of totalizers, run timers, and count starts.
 - 3. Demonstrate ability to create, modify, and download control strategies to the PLCs.
 - (ii) Both normal operating sequences and fault conditions shall be simulated, including redundancy and failover testing. System Supplier shall also test the control logic in the PLC to verify proper operation. The testing shall include, as a minimum:
 - 1. Local/Remote Check – This test will confirm that the SCADA software and operator can control equipment only when the equipment is in the REMOTE control mode.

2. Alarms – This test will confirm the operation of all alarms generated specifically by the strategy
 3. Operator Adjustable Values – This test will confirm that all such values may be adjusted from the SCADA HMI and the OIT, that values shown are correct and in the correct engineering units, are coordinated between the SCADA HMI and the OIT, and that default values are loaded at PLC startup.
 4. PID Loops – This test will confirm the correction operation of PID loops, including Auto/Manual operation, and tuning parameters.
 5. Remote-Manual Operation of Devices, according to the control strategy.
 6. Remote-Automatic Operation of Devices, according to the control strategy.
 7. Enable/Disable of Control Strategies.
5. Discretionary Tests
 - a. The FDT shall also include a minimum of four (4) hours for discretionary tests to be conducted by Owner and/or Engineer. Test attendees will exercise the System by randomly selecting functions to perform. The System shall perform as specified. Any deviations shall be corrected and demonstrated to the Owner and/or Engineer.
 - b. The Owner reserves the right to test any specified function, even if not explicitly stated in test forms or procedures. The discretionary tests shall be documented by the I&C System Supplier. The discretionary test form shall contain fields to describe the function tested and signature fields for the Owner, I&C System Supplier, and Engineer.
 6. Continuous Operation
 - a. After the successful completion of the functional testing specified above, a 48-hour continuous run of the complete System shall be performed. The test shall be passed if no function is lost, no hardware or software failure occurs, and no module automatic failover occurs. Hardware failure is defined for this test as the loss of a major piece of hardware, such as an HMI Server, PLC processor, I/O board, power supply, UPS, other panel equipment, or improper operation by the controller.
 - b. During this test, the Computer Control System shall be exercised (with simulated inputs, events, and conditions) in a manner that approximates an operational environment.
 - c. No programming changes will be allowed to bypass failed modules during this test. Any software and/or hardware correction made to the Computer Control System shall result in the mandatory rerun of the entire 48-hour test.
 7. FDT Completion

- a. Throughout the FDT, System Supplier shall maintain a listing of all discrepancies. At the conclusion of all formal testing, Owner and/or Engineer shall review the FDT punchlist with the System Supplier to determine resolution. If it is determined that discrepancies exist which affect critical system functions, they shall be corrected and an FDT retest conducted prior to shipment. System Supplier shall reimburse Owner and/or Engineer for all expenses incurred in connection with attending repeated factory or site testing.
 - b. If it is determined that the system deficiencies do not affect system functionality, the Engineer will grant the System Supplier approval for shipment. However, all FDT punchlist items shall be corrected and demonstrated to Owner and/or Engineer prior to the start of the Site Demonstration Test.
- M. Preliminary Field Testing
- 1. For each test stage, the System Supplier shall perform a series of testing activities to verify proper installation and operational readiness of the Computer Control System components. Preliminary Field Testing will normally be conducted one PLC and/or process area at a time.
 - 2. As a minimum, System Supplier shall perform the following tasks:
 - a. Calibrate instruments
 - b. Confirm network communications
 - c. Confirm operation of HMI system
 - d. Perform Loop Testing from field device to HMI. Loop Testing shall not be conducted until the associated field wiring has been finalized, including the installation of permanent wire markers. System Supplier shall use forms of the same format as the Initial I/O Point Checkout and shall verify every I/O point from field device to HMI display. System Supplier shall closely coordinate the Loop Testing with the Contractor and Owner and/or Engineer.
 - e. Verify and adjust, as necessary, system performance parameters and system responses under field operational conditions.
 - 3. Preliminary Field Testing will normally be unwitnessed; however, Owner reserves the right to have Owner staff and/or Engineer witness all or portions of the field testing. System Supplier shall submit a certified copy of the completed Loop Testing verification forms and the testing schedule to the Owner and Engineer for review a minimum of 3 weeks in advance of the proposed Loop Testing start date prior to scheduling the Site Demonstration Test.
- N. Site Demonstration Test (SDT)
- 1. A Site Demonstration Test (SDT) of the Computer Control System functions, software, and performance shall be conducted by the System Supplier after

all Computer Control System elements have been installed and the Preliminary Field Testing (including Loop Testing), has been completed by the System Supplier. The System Supplier shall submit updated testing procedures to the Owner and Engineer a minimum of 8 weeks in advance of the start of site acceptance testing. Acceptance of the SCADA Installation testing shall be provided in writing by the Engineer or Owner before the testing at the project site may begin.

2. The SDT shall be performed to verify complete operation of the entire system, requiring a repeat of the Factory Demonstration Test but with the equipment installed at the permanent sites and connected to the process I/O, and shall include additional tests required to verify field-installed equipment which was not available at the factory.
 3. The System Supplier shall:
 - a. Demonstrate each functional requirement identified by the specification. This demonstration shall repeat the tests used during FDT but using real rather than simulated conditions.
 - b. Demonstrate all equipment control functions, including the operation of automatic control strategies. Actuation of field devices shall be closely coordinated with Owner's staff.
 - c. Verify system performance parameters and system responses under field operational conditions.
 - d. Verify accuracy of documentation, especially operator's manuals, software documentation, Record Drawings, and site operating instructions.
 4. Site Discretionary Testing by Owner
 - a. The Owner reserves the right to test any specified function, even if not explicitly stated in test forms or procedures. One hundred-twenty hours shall be reserved for this testing. The discretionary tests shall be documented by the I&C System Supplier. The discretionary test form shall contain fields to describe the function tested and signature fields for the Owner, I&C System Supplier, and Engineer.
- O. System Acceptance Test (SAT)
1. At the completion of SDT, the Owner will conduct a System Acceptance Test (SAT) in the normal day-to-day operation of the facilities utilizing all equipment, software, and services provided under this Contract. All functional and performance requirements specified in the Contract Documents shall be met during the SAT. System Supplier personnel may participate in any and all parts of this demonstration as observers at the discretion of the Owner.
 2. A System Acceptance Test shall be conducted for each facility where work is being completed as described in Section 01100. Once SATs have been completed for every facility, an overall System Acceptance Test shall be conducted to confirm the successful implementation of all interfacility communication and process operation.

3. The duration of the System Acceptance Test shall be not less than 30 calendar days (720 hours). During the SAT, no downtime shall be permissible. If, at any time during the SAT, a failure occurs which results in downtime being assessed, the test shall continue on a day-by-day basis, dropping off the oldest day's test results. This demonstration shall continue until it is completed successfully or until 60 calendar days have passed.
4. Downtime accrues in three ways as defined below:
 - a. Downtime accrues when one or more functional capability cannot be performed due to failure of equipment or software provided and/or installed by System Supplier. Downtime also accrues when any piece of field equipment cannot be monitored/controlled due to failure of equipment or software provided and/or installed by System Supplier.
 - b. For failures that occur outside the period of 7:00 AM to 4:00 PM, Monday through Friday, a four-hour travel time allowance will be made before downtime begins to accrue. It is System Supplier's responsibility to arrange suitable communications to enable the Owner to notify the System Supplier's field representative of failures.
 - c. Downtime accrues if the same piece (or redundant pair) of equipment fails more than twice during the test period. In other words, repeated failover to backup equipment will not be allowed even though each individual failover action is successful and no functionality is lost.
 - d. Downtime accrues if backup equipment is not repaired and operational within eight hours after initial failure. Accrual begins after the grace period allotted for repair.
5. Downtime will not be accrued in the following circumstances:
 - a. Failures due to Owner facilities and support equipment, including power sources.
 - b. Failures caused by Owner personnel.
 - c. Malfunction of equipment not supplied by System Supplier.
6. The System Supplier shall log and submit any corrective actions made during the SAT. The SAT may be suspended by mutual agreement between Owner and System Supplier.
7. Network testing shall be provided as indicated herein and in section 13590 Process Control Network Systems.

3.05 TRAINING

- A. System Supplier shall conduct training courses for personnel selected by Owner. Training shall be provided in the following categories: instrument, control system maintenance, operator (pre-installation), operator (post-installation), programmer (HMI software), programmer (PLC software), networking, and supplemental shall be provided. Training shall be conducted by experienced instructors who are familiar with the specific system supplied.
- B. General Training Requirements

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1. In general, System Supplier's standard training courses may be used to meet the training objectives specified. Where standard courses do not meet these objectives, additional coursework shall be developed. Clock hour requirements for each level of training are shall be as listed. A "clock hour" is defined as one hour of instruction or supervised training exercise. Training hour requirements are the number of hours of training to be provided for each student. Additional training time shall be provided if considered necessary to meet the training objectives.
 2. Training Costs
 - a. All costs associated with the training program; excluding travel, lodging, and per diem expenses for Owner's and Engineer's personnel to attend off-site training programs; shall be the responsibility of System Supplier and shall be included in the contract price.
 3. Lessons
 - a. Training lesson plans and other information for the second stage submittal as defined herein shall be submitted at least 30 days prior to the start of training.
 4. Video Recording
 - a. All training sessions shall be video recorded by the System Supplier for Owner's future use in training other personnel. Video recorded sessions shall be saved to physical digital storage media for delivery to Owner. Pre-recorded videos of System Supplier's standard training programs may be substituted if they cover the same topics and are developed for the same versions of hardware and software. Furnishing videos of standard training programs shall not relieve System Supplier from any of the training requirements specified herein.
 5. Training Scheduling
 - a. The Contractor and I&C System Supplier shall coordinate with the Owner's Training Coordinator to develop a list of personnel to be trained and to establish expected training outcomes, objectives, and dates 120 days prior to commissioning of the control system.
- C. Control System Maintenance Training
1. System maintenance training shall be provided to enable Owner's personnel to perform routine and preventive maintenance, troubleshoot, and repair all hardware furnished with the system, except equipment provided by the HMI computer manufacturer. Maintenance and repair instruction shall assume that Owner's personnel will repair equipment by replacing circuit boards and modules and shall not include instruction on circuit board level repair.
 2. Classes
 - a. All maintenance training shall be conducted at Owner's facilities. Each session shall consist of eight hours of training for five of the Owner's personnel.

3. Content of Classes
 - a. The training shall cover at a minimum the following topics:
 - (i) Preventative, scheduled maintenance for all equipment.
 - (ii) Function and normal operation of circuit boards and modules.
 - (iii) Diagnosis of hardware failures to the faulted board or module.
 - (iv) Removal and replacement of removable circuit boards and modules.
 - (v) Emergency maintenance and restoration procedures.
 - b. The maintenance training program shall be developed for personnel who have experience in electronics maintenance and repair and a general knowledge of computer systems, but not necessarily any familiarity with the specific hardware furnished.
- D. Operator Training
1. Owner's personnel will utilize the system for day-to-day monitoring and/or control of the facilities. The training program shall provide operators with sufficient knowledge to move from screen to screen within the system, understand the contents of group and detailed point displays, react to and acknowledge alarms, adjust control setpoints and alarm limits, configure and print shift reports, print preconfigured reports on demand, control equipment connected to the system, and react to and resolve minor system errors.
 2. Classes
 - a. Operator training shall include sessions as specified below.
 - (i) Pre-installation Session
 1. Each pre-installation training session shall consist of eight hours of training for fifteen students at the Owner's facility.
 - (ii) Post-installation Session
 1. The post-installation training shall include three separate, but identical, sessions for three shifts of personnel and shall be conducted at the Owner's facilities. Each class shall consist of four hours of instruction using the lesson plan submitted and approved for use. The post-installation sessions may have to be conducted outside normal working hours to accommodate the working schedule of Owner's personnel. The post-installation training sessions shall be conducted for fifteen of the Owner's operating personnel.
 - b. Content of Classes
 - (i) Each session shall cover at least the following topics:
 1. Power-up, "bootstrapping", and shutdown of all hardware devices.
 2. Logging on and off the system and the use of passwords.
 3. Access and interpretation of standard displays and diagnostics.
 4. Use and care of operator workstations, servers, video displays, printers, and other control room hardware, including replenishment of supplies and replacement of ribbons and ink cartridges.

5. Moving from screen to screen within the graphic display environment.
 6. Interpretation of preconfigured group and detailed point or database displays.
 7. Response to and acknowledgment of alarms.
 8. Adjustment of control set points and alarm limits.
 9. Configuration and printing of shift and other reports by schedule or on demand.
 10. Control of field equipment and devices connected to the system.
 11. Manual entries to database points.
 12. Generation of current (real-time) and historical custom and predefined reports and trend displays.
 13. Appropriate responses to software and hardware errors.
 14. Enabling and disabling individual inputs and outputs.
- (ii) The operator-training program shall be developed for personnel with no prior experience with the hardware and software provided as part of the project.

E. Network Training

1. System Supplier shall provide training on network equipment provided. Network training shall be conducted in one session at Owner's facilities using the hardware and software installed for this project.
 - a. Course shall provide an overall description of the network and how it operates.
 - b. A one hour course (for each make/model of switch, router, and firewall) on configuration shall be provided for up to five people. This instruction shall be aimed at a network administrator's level of understanding, and shall be provided by the individual that configured the devices. The course shall review the configuration settings. Course training material shall be vendor provided equipment manuals.
 - c. A one hour course on the use of the management software shall be provided for up to five people. This instruction shall be aimed at a network administrator's level of understanding, and shall be provided by the individual that configured the software. Course training material shall be vendor provided software manuals.
 - d. Training shall be provided on the use of any Network Test Equipment provided. Course training material shall be vendor provided equipment manuals.
2. The training shall provide instruction for up to five of Owner's personnel.

F. Supplemental Training

1. System Supplier shall provide additional training to Owner's personnel on topics of Owner's choosing. Supplemental training shall be conducted in one

session at Owner's facilities using the hardware and software installed for this project. The training shall consist of eight hours of instruction for ten students.

END OF SECTION



13500 APPENDIX A SCADA System Software Standards and Conventions

Initially Prepared by:



For Submittal #4 03-31-2023.

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Purpose

The main purpose of this document is to set standards which will assure uniformity of design concepts, formats, methodologies, procedures and quality of work for Human Machine Interface (HMI) SCADA, Operator Interface Terminal (OIT) local touch panel, and Programmable Logic Controller (PLC) programming. These standards will be implemented throughout the KCMO Wastewater SCADA Systems.

Programmers must review this document and adapt to these standards for design of the HMI, OIT and PLC programs for which they are responsible.

Hardware

The following table lists hardware that shall be used with the City Control System. The PLC Hardware shall be either Control Logix or Compact Logix by Allen Bradley as specified. The OIT's shall be PanelView by Allen Bradley.

Category	Hardware Description	Version
Control Logix CPU	1756-L82E	32.0-up
Control Logix Ethernet Module	1756-EN2T	
Control Logix Digital Input Module	1756-IA16I	
Control Logix Digital Output Module	1756-OA16I	
Control Logix Analog Input Module	1756-IF8I	
Control Logix Analog Output Module	1756-OF8	
Compact Logix CPU	1769-L33ER	32.0-up
Compact Logix Digital Input Module	1769-IA8I	
Compact Logix Digital Output Module	1769-OW8I	
Compact Logix Analog Input Module	1769-IF4I	
Compact Logix Analog Output Module	1769-OF8C	
Operator Interface Terminal (OIT)	PanelView Plus 7 Performance	11.0-up
HMI Servers	Stratus	
HMI Workstations	Thin Clients	

Table 1 - City Scada System Hardware

Software

The following table lists software and versions, as of the date of this document that shall be used with the City Scada System.

Category	Software Description	Version
Programmable Logic Controller (PLC)	RSLogix Studio 5000	32.0 or latest (with latest Patches)
Human Machine Interface (HMI)	FTView SE Distributed System	11.0 or latest (with latest Patches)
PanelView Operator Interface Terminal	FTView ME	11.0 or latest (with latest Patches)
Operating System for Site Control System Computers	Microsoft Server 2016 Standard	Latest
Operating System for Site Control System Computers	Microsoft Windows 10	Latest
Historical Server	Historian	6.0 or latest (with latest Patches)
SQL	SQL Standard	2016
Thin Manager	Thin Manager Software	11.0 or latest
PlantPax Library	Rockwell PlantPax Library	4.1

Table 2 - City Scada System Software

Redundancy

Plant Control System will use Stratus Servers with built in hardware redundancy and implement software to implement redundancy at the HMI level. Two HMI I/O (PASS) Virtual Machine servers will reside on the Host Server. Each server continuously communicates with the PLC's on the network. All other HMI's are considered "ThinClient View Nodes" and do not have the ability to communicate directly with the PLC's.

All ThinClient view nodes on the Control System network will communicate with one Thin Manager server (TM) I/O server for its data. If communications is lost with the primary Thin Manager I/O server, a view node will switch to the backup Thin Manager I/O server.

Networks

Ethernet

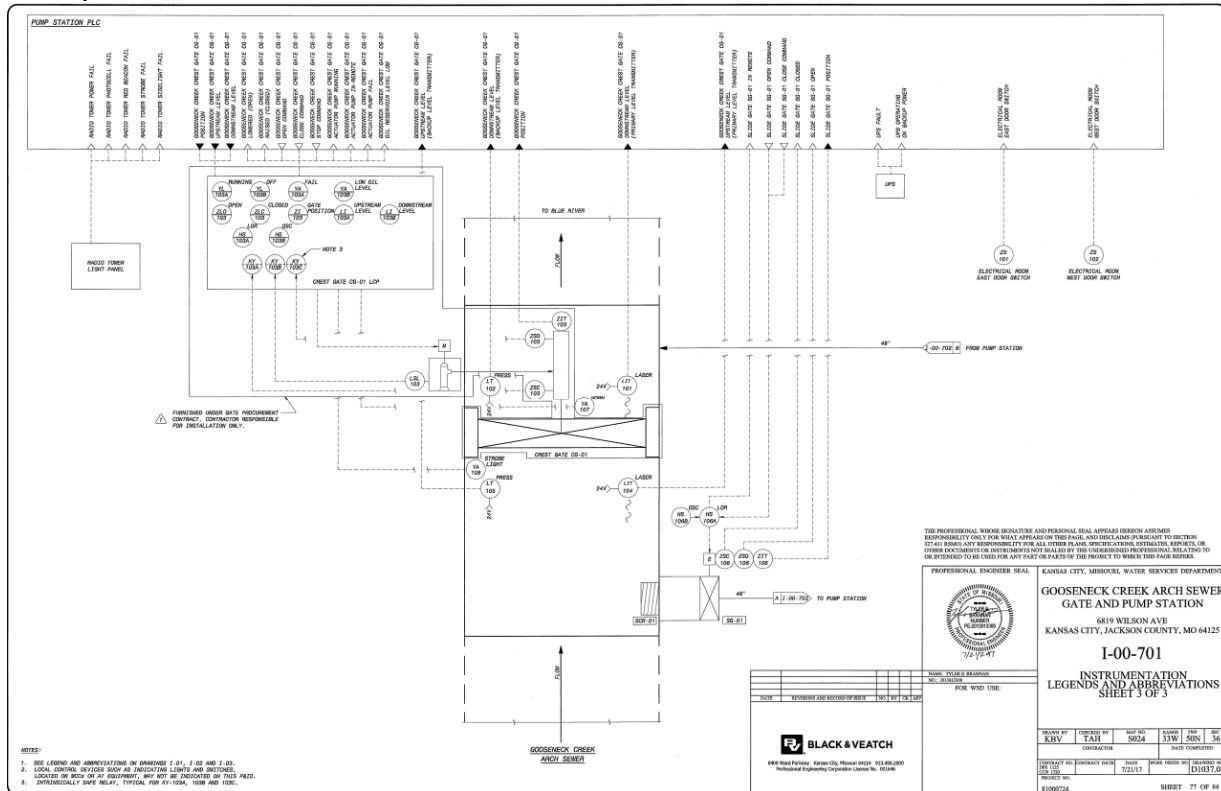
The Control System is based on an Ethernet network. The network consists of HMI's, OIT's, PLC's, switches, routers, computers, power monitors, VFDs, MCCs, and etc which will use the (TCP/IP for PCs) and (Ethernet/IP for everything else) protocol. Each device on an Ethernet network must have a unique identifier, known as an IP address. The list of IP address locations for devices is maintained by the City of KCMO Water Services – Wastewater Division, herein referred to as "Owner". If a Domain Controller (DC) is used, then that DC will assign the IP address per equipment's MAC address. (PCs only) When a DC is not used then a static IP address will be assigned. Require Layer 3 managed switches whenever radio communications are utilized. Layer 2 switches shall be used to develop VLANs to separate in-plant device communications and maintain healthy network traffic flows as needed. All access points to the network shall be physically lockable.

VLANs divide physical networks into smaller logical networks to increase performance, improve manageability, and simplify network design. VLANs are achieved through configuration of Ethernet switches. Each VLAN consists of a single broadcast domain that isolates traffic from other VLANs. Using VLANs limits the broadcast traffic, as well as allowing logical subnets to span multiple physical locations. There are two categories of VLANs:

- Static, often referred to as port-based, where switch ports are assigned to a VLAN so that it is transparent to the end user.
- Dynamic, where an end device negotiates VLAN characteristics with the switch or determines the VLAN based on the IP or hardware addresses.

Although more than one IP subnet may coexist on the same VLAN, the general recommendation is to use a one-to-one relationship between subnets and VLANs. This practice requires the use of a router or multi-layer switch to join multiple VLANs. Many routers and firewalls support tagged frames so that a single physical interface can be used to route between multiple logical networks. Properly segmented networks can also mitigate the risks of broadcast storms that may result from port scanning or worm activity.

Example P&ID



Alternate Naming: ISA Standards

When a P&ID is not available, or it fails to cover a few points that exist (such as internal panel equipment failures for example) Tag names shall be given based upon the ANSI/ISA 5.1 Standard. The table below is the “general” form of the standard, and a more detailed explanation follows.

Meanings of Identification Letters

Table 4.1 — Identification letters

Note: Numbers in parentheses refer to the preceding explanatory notes in Clause 4.2.

	First letters (1)		Succeeding letters (15)		
	Column 1	Column 2	Column 3	Column 4	Column 5
	Measured/Initiating Variable	Variable Modifier (10)	Readout/Passive Function	Output/Active Function	Function Modifier
A	Analysis (2)(3)(4)		Alarm		
B	Burner, Combustion (2)		User's Choice (5)	User's Choice (5)	User's Choice (5)
C	User's Choice (3a)(5)			Control (23a)(23e)	Close (27b)
D	User's Choice (3a)(5)	Difference, Differential, (11a)(12a)			Deviation (28)
E	Voltage (2)		Sensor, Primary Element		
F	Flow, Flow Rate (2)	Ratio (12b)			
G	User's Choice		Glass, Gauge, Viewing Device (16)		
H	Hand (2)				High (27a)(28a)(29)
I	Current (2)		Indicate (17)		
J	Power (2)		Scan (18)		
K	Time, Schedule (2)	Time Rate of Change (12c)(13)		Control Station (24)	
L	Level (2)		Light (19)		Low (27b)(28)(29)
M	User's Choice (3a)(5)				Middle, Intermediate (27c)(28) (29)
N	User's Choice (5)		User's Choice (5)	User's Choice (5)	User's Choice (5)
O	User's Choice (5)		Orifice, Restriction		Open (27a)
P	Pressure (2)		Point (Test Connection)		
Q	Quantity (2)	Integrate, Totalize (11b)	Integrate, Totalize		
R	Radiation (2)		Record (20)		Run
S	Speed, Frequency (2)	Safety(14)		Switch (23b)	Stop
T	Temperature (2)			Transmit	
U	Multivariable (2)(6)		Multifunction (21)	Multifunction (21)	
V	Vibration, Mechanical Analysis (2)(4)(7)			Valve, Damper, Louver (23c)(23e)	
W	Weight, Force (2)		Well, Probe		
X	Unclassified (8)	X-axis (11c)	Accessory Devices (22), Unclassified (8)	Unclassified (8)	Unclassified (8)
Y	Event, State, Presence (2)(9)	Y-axis (11c)		Auxiliary Devices (23d)(25)(26)	
Z	Position, Dimension (2)	Z-axis (11c), Safety Instrumented System (30)		Driver, Actuator, Unclassified final control element	

Step 1:

Assign each IO point a 3-digit number. When multiple IO points service the same piece of equipment (such as a Pump's start/stop/speed/fail) each point will share the same number as the "master" it serves. These numbers are broken up as follows:

First Digit:	Second Digit:	Third Digit:
<p>A general "Area" within the PLC's scope of control. The order shall be ascending, in the general process flow of the system. For example, you may have:</p> <p>Influent Pump = 0 RAS = 1 WAS = 2 Wetwell #1 = 3 Wetwell #2 = 4 Other areas = 5</p>	<p>The second digit is the general device type within the PLC' scope of control. The lowest numbers should be the biggest, most important equipment (such as pumps for example)</p> <p>Pumps = 0 Grinders = 1 Valves = 2 Analog transmitters = 3</p>	<p>The third digit is for identifying multiple instances of the same type of device in the same area. An example is shown below:</p> <p>Wetwell #1 Pump #1 = 301 Wetwell #1 Pump #2 = 302 Wetwell #2 Analog Level #1 = 431 Wetwell #2 Analog Level #2 = 432</p>

Step 2:

Assign the correct letter prefix to each IO point. This is based purely on the ANSI/ISA Table 4.1, but for quick reference here is a list of prefixes that are commonly used for Water/Wastewater applications.

Digital Inputs		Reset	low-low	low	med	high	high-high
Level Switch	LS	LSLLR	LSLL	LSL	LSM	LSH	LSHH
Pressure Switch	PS			PSL	PSM	PSH	
Fail/alarm	YA		YALL	YAL		YAH	YAHH
Flow Indicate	FI			FIL	FIM	FIH	
Level Indicate	LI			LIL	LIM	LIH	
Pressure indicates	PI			PIL	PIM	PIH	
Current Indicate	II			IIL	IIM	IIH	
Voltage Indicate	EI			EIL	EIM	EIH	
Temperature Indicate	TI			TIL	TIM	TIH	
Density Indicate	DI			DIL	DIM	DIH	
Speed Indicate	SI			SIL	SIM	SIH	
Remote Output CMD	YX						
Event Light	YL						
Event Indicate	YI						
Hand Switch	HS						
Valve Position	ZS						
Valve Closed FB	ZSC						
Valve Open FB	ZSO						
Valve Center FB	ZSM						
Valve Moving/traveling	ZSX						

<table border="1"> <tr><td>Digital Outputs</td><td></td></tr> <tr><td>General Output CMD</td><td>YC</td></tr> <tr><td>Motor Run CMD</td><td>MR</td></tr> <tr><td>Valve Open CMD</td><td>XVO</td></tr> <tr><td>Valve Close CMD</td><td>XVC</td></tr> <tr><td>Valve Middle CMD</td><td>XVM</td></tr> </table>		Digital Outputs		General Output CMD	YC	Motor Run CMD	MR	Valve Open CMD	XVO	Valve Close CMD	XVC	Valve Middle CMD	XVM	Analog Inputs			<table border="1"> <tr><td>Analog Outputs</td><td></td></tr> <tr><td>Valve SP</td><td>ZIC</td></tr> <tr><td>Pressure SP</td><td>PIC</td></tr> <tr><td>Current SP</td><td>IIC</td></tr> <tr><td>Voltage SP</td><td>EIC</td></tr> <tr><td>Temperature SP</td><td>TIC</td></tr> <tr><td>Flow SP</td><td>FIC</td></tr> <tr><td>Level SP</td><td>LIC</td></tr> <tr><td>Speed SP</td><td>SIC</td></tr> <tr><td>Torque SP</td><td>MIC</td></tr> </table>		Analog Outputs		Valve SP	ZIC	Pressure SP	PIC	Current SP	IIC	Voltage SP	EIC	Temperature SP	TIC	Flow SP	FIC	Level SP	LIC	Speed SP	SIC	Torque SP	MIC
		Digital Outputs																																				
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Flow SP	FIC																																					
Level SP	LIC																																					
Speed SP	SIC																																					
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Valve Position	ZIT																																					
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Voltage Value	EIT																																					
Temperature Value	TIT																																					
Flow Value	FIT																																					
Level Value	LIT																																					
Density Value	DIT																																					
Speed Value	SIT																																					
Torque Value	MIT																																					

Step 3:

Once the prefix and number are assigned, digital values get a suffix that gives more specific information about the exact function of the bit. These suffixes are tied to the prefixes, so a “1A” suffix with a “HS” prefix means something completely different than with a “YA” prefix. See the below tables.

IO Code	Modifier	Modifier Translation
HS	1A	Auto/Remote (Sec)
	1A1	Auto/Remote
	1B	Hand/Local (Sec)
	1B1	Hand/Local
	1C	Off
	2A	Start
	2B	Stop
	2C	Emergency
	3A	Fwd
	3B	Rev
	4A	Jog Fwd
	4B	Jog Rev
	5A	reset
	5B	silence
	6A	Hi Speed
	6B	Low Speed
	7A	Bypass

IO Code	Modifier	Modifier Translation
YA	0 (A-B-C)	UNDEFINED: SPECIFIC INSTANCES
	1A	General Fail/Fault
	1B	Overload
	1C	Temp
	1D	Vibration
	1E	Seal
	1F	Trip
	2A/B/C	Misalignment
	1G	High Overtorque
	1G1	Hi Hi Overtorque
	1H	Filter Blocked
	1I	Obstruction
	1J	Shear Pin Fail

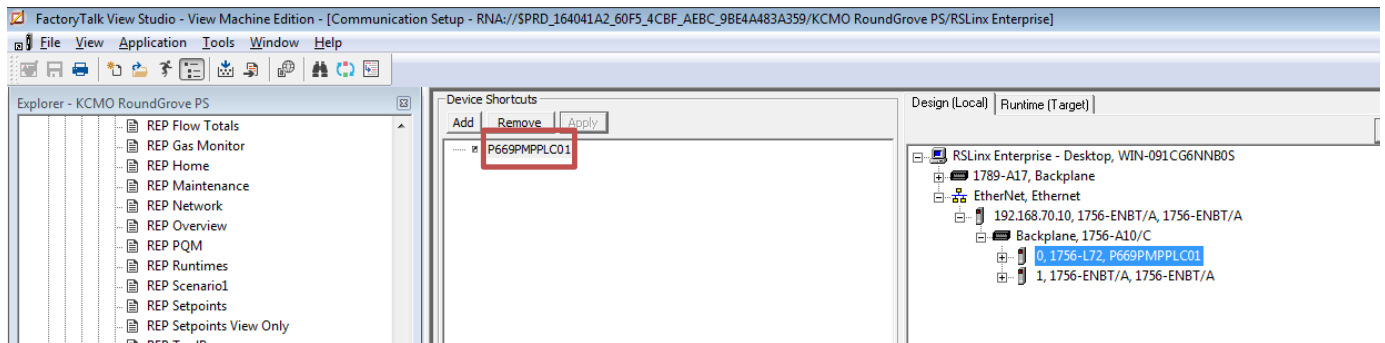
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IO Code	Modifier	Modifier Translation
MR, YC, YX, ZS	0 (A-B-C)	ALM OR OTHER UNDEFINED INSTANCES
YI, YL	1A	On
	1B	Off
	2A	Start/Run (FWD)
	2B	Start/Run (REV)
	3A	Stop (FWD)
	3B	Stop (REV)
	4A	Open
	4B	Close
	5A	In Auto/Remote
	5B	In Hand/Local
	5C	In Off
	6A	High
	6B	Low
	7A	OK/Normal
	7B	NOT OK/Emergency
	7C	Bypassed
	8A	NORTH
	8B	SOUTH
	8C	EAST
	8D	WEST
	8E	OTHER (BETWEEN 2 STATES OR TRANSIT)
	9A	EXTENDED
	9B	RETRACTED

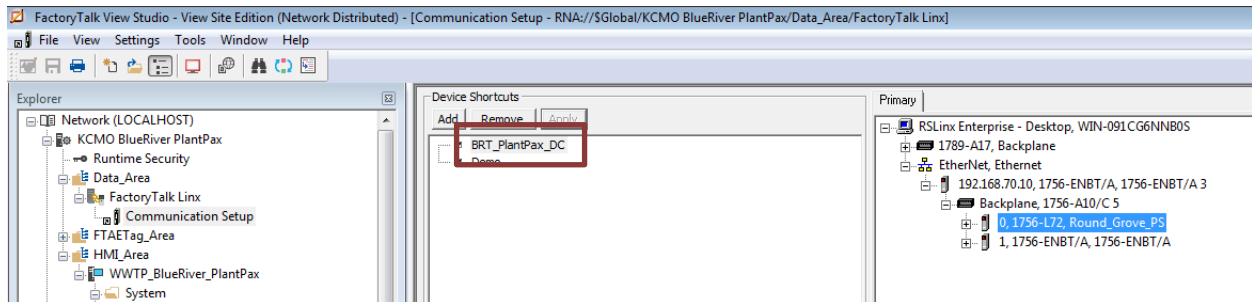
Meanings of Identification Numbers

PlantPax Tag Names with Shortcuts

Shortcuts are used in the OIT/HMI to establish a path from the HMI to the PLC.
FTView ME version for an OIT



FTView SE version for an HMI



Both OIT/HMI Shortcut and PlantPax Tag example. {[P635PMPLC01]LIT104}

	Name	Value	Tag	Description
1	#102	{[P635PMPLC01]LIT104}	...	Object Tag (P_AIn, P_AInAdv, P_AInDual, or P_AInMulti)
2	#103	{P635PMPLC01}	...	Path (include program scope if tag is a program scope tag)
3	#120		...	Display's left position (e.g. 100)
4	#121		...	Display's top position (e.g. 100)
5	#122	1	...	0 = Always show Faceplate; 1= Show Quick Display for users

PlantPax Tag Name Examples

shortcut	PlantPax Names	PLC tag Description
P701PRIPLCCP01	HS131_1A	Moyno 1 HOA in Auto
P701PRIPLCCP01	YA101_1B	Moyno Pump 1 Overload
P701PRIPLCCP01	YI101_2A	Moyno 1 Pump Running
P701PRIPLCCP01	YA101_1E	Moyno 1 Seal Water OK
P701PRIPLCCP01	YI111_2A	Moyno 1 Grinder Running Forward
P701PRIPLCCP01	YI111_2B	Moyno 1 Grinder Running Reverse
P701PRIPLCCP01	YA111_1B	Moyno 1 Grinder Overload
P701PRIPLCCP01	HS231_1A	Moyno 2 HOA in Auto
P701PRIPLCCP01	YA201_1B	Moyno Pump 2 Overload
P701PRIPLCCP01	YI201_2A	Moyno 2 Pump Running
P701PRIPLCCP01	YA201_1E	Moyno 2 Seal Water OK
P701PRIPLCCP01	YI211_2A	Moyno 2 Grinder Running Forward
P701PRIPLCCP01	YI211_2B	Moyno 2 Grinder Running Reverse
P701PRIPLCCP01	YA211_1B	Grinder #2 Overload
P701PRIPLCCP01	HS331_1A	Moyno 3 HOA in Auto
P701PRIPLCCP01	YA301_1B	Moyno Pump 3 Overload
P701PRIPLCCP01	YI301_2A	Moyno 3 Pump Running
P701PRIPLCCP01	YA301_1E	Moyno 3 Seal Water OK
P701PRIPLCCP01	YI311_2A	Moyno 3 Grinder Running Forward
P701PRIPLCCP01	YI311_2B	Moyno 3 Grinder Running Reverse
P701PRIPLCCP01	YA311_1B	Grinder #3 Overload
P701PRIPLCCP01	HS431_1A	Moyno 4 HOA in Auto
P701PRIPLCCP01	YA401_1B	Moyno Pump 4 Overload
P701PRIPLCCP01	YI401_2A	Moyno 4 Pump Running
P701PRIPLCCP01	YA401_1E	Moyno 4 Seal Water OK
P701PRIPLCCP01	YI411_2A	Moyno 4 Grinder Running Forward
P701PRIPLCCP01	YI411_2B	Moyno 4 Grinder Running Reverse
P701PRIPLCCP01	YA411_1B	Grinder 4 Overload
P701PRIPLCCP01	YA531_1H	Basement Flood Detection
P701PRIPLCCP01	YI501_1A	Sump Pump Running
P701PRIPLCCP01	YA031_1A	3 Phase Power Loss
P701PRIPLCCP01	YA531_1H	Basement Flood Detection
P701PRIPLCCP01	YI501_1A	Sump Pump Running
P701PRIPLCCP01	YI501_1A	Sump Pump Running

P701PRIPLCCP01	MR101_2A	Moyno Pump 1 Start
P701PRIPLCCP01	YC101_7A	Pump 1 Pressure Interlock OK
P701PRIPLCCP01	MR111_2A	Moyno Grinder 1 Run Forward
P701PRIPLCCP01	MR111_2B	Moyno Grinder 1 Run Reverse
P701PRIPLCCP01	MR201_2A	Moyno Pump 2 Start
P701PRIPLCCP01	YC201_7A	Pump 2 Pressure Interlock OK
P701PRIPLCCP01	MR211_2A	Moyno Grinder 2 Run Forward
P701PRIPLCCP01	MR211_2B	Moyno Grinder 2 Run Reverse
P701PRIPLCCP01	MR103_2A	Moyno Pump3 Start
P701PRIPLCCP01	MR311_2A	Moyno Grinder 3 Run Forward
P701PRIPLCCP01	MR311_2A	Moyno Grinder 3 Run Forward
P701PRIPLCCP01	MR311_2B	Moyno 3 Grinder Reverse
P701PRIPLCCP01	MR401_2A	Moyno Pump 4 Run
P701PRIPLCCP01	MR411_2B	Moyno Grinder 4 Run Reverse
P701PRIPLCCP01	MR411_2A	Moyno Grinder 4 Run Forward
P701PRIPLCCP01	MR411_2B	Moyno Grinder 4 Run Reverse
P701PRIPLCCP01	YC531_0A	Basement Flood Alarm
P701PRIPLCCP01	IIT111	Moyno 1 Grinder Current
P701PRIPLCCP01	IIT101	Moyno 1 Pump Current
P701PRIPLCCP01	IIT211	Moyno 2 Grinder Current
P701PRIPLCCP01	IIT201	Moyno 2 Pump Current
P701PRIPLCCP01	IIT311	Moyno 3 Grinder Current
P701PRIPLCCP01	IIT301	Moyno 3 Pump Current
P701PRIPLCCP01	IIT411	Moyno 4 Grinder Current
P701PRIPLCCP01	PIT101	Moyno 1 Pump Discharge Pressure
P701PRIPLCCP01	PIT201	Moyno 2 Pump Discharge Pressure
P701PRIPLCCP01	PIT301	Moyno 3 Pump Discharge Pressure
P701PRIPLCCP01	PIT401	Moyno 4 Pump Discharge Pressure

Table 3 - Tag Name Codes

“Note: That in the examples in Table 3 “P701” refers to the facility ID. Facility IDs are identified in the “Non PlantPax Tags” section”

PlantPax Tag Name Examples if P&IDs are not available

Analog Input

LIT- Wetwell Level Indication	
AOI P AIn	LIT101
AOI P AIChan	LIT101 Chan (needed for HMI/OIT faceplate)

Table 4 – PlantPax Analog Input Example Tag Names

Constant Speed Motor

Pump 1	
AOI P Motor	MT101
AOI P Intlk	MT101 Intlk (needed for HMI/OIT faceplate)
AOI P Perm	MT101 Perm (needed for HMI/OIT faceplate)
AOI P_ResInh	MT101_ResInh (needed for HMI/OIT faceplate)
AOI P Motor	MT101 Ovld (needed for HMI/OIT faceplate)
AOI P_RunTime	MT101_RunTime (needed for HMI/OIT faceplate)

Table 5 – PlantPax Constant Speed Motor Example Tag Names

VFD

Pump 1	
AOI P VSD	MT101
AOI P Intlk	MT101 Intlk (needed for HMI/OIT faceplate)
AOI P Perm	MT101 Perm (needed for HMI/OIT faceplate)
AOI P_ResInh	MT101_ResInh (needed for HMI/OIT faceplate)
AOI P VSD	MT101 Ovld (needed for HMI/OIT faceplate)
AOI P_RunTime	MT101_RunTime (needed for HMI/OIT faceplate)

Table 6 – PlantPax VFD Example Tag Names

Hand Operated Motor

Pump 1	
AOI P MotorHO	MT101
AOI P Intlk	MT101 Intlk (needed for HMI/OIT faceplate)
AOI P Perm	MT101 Perm (needed for HMI/OIT faceplate)
AOI P_ResInh	MT101_ResInh (needed for HMI/OIT faceplate)
AOI P MotorHO	MT101 Ovld (needed for HMI/OIT faceplate)
AOI P_RunTime	MT101_RunTime (needed for HMI/OIT faceplate)

Table 7 – PlantPax Hand Operated Motor Example Tag Names

Open/Close Valves

Slide Gate 1	
AOI P ValveMO	XV101
AOI P Intlk	XV101 Intlk (needed for HMI/OIT faceplate)
AOI P Perm	XV101 OpenPerm (needed for HMI/OIT faceplate)
AOI P Perm	XV101 ClosePerm (needed for HMI/OIT faceplate)
AOI P ValveStats	XV101 ValveStats (needed for HMI/OIT faceplate)

Table 8- PlantPax Open/Close Valve Example Tag Names

Variable Position Valve

Control Valve 1	
AOI P ValveC	XV101
AOI P AIn	ZIT101
AOI P Intlk	XV101 Intlk (needed for HMI/OIT faceplate)
AOI P Perm	XV101 Perm (needed for HMI/OIT faceplate)

Table 9 – PlantPax Variable Position Valve Example Tag Names

Digital Inputs

Various Inputs	
AOI P DIn	LSHH (Level Switch High High)
AOI P DIn	LSLL (Level Switch Low Low)
AOI P DIn	LSHH 201 (Level Switch Sump High)
AOI P DIn	YA101 1A (3Phase Loss)
AOI P DIn	HS101 1A (HOA Switch in Auto)

Table 10 – PlantPax Digital Inputs Example Tag Names

Non PlantPax Tags

Description of a “Non PlantPax Tag”, any tag that is an Internal Program Tag in the PLC not a PlantPax Controller tag for Global Objects.

In the Studio 5000 software, a tag must not be over maximum of 30 characters and be all capital letters. Even though a tag can be longer in the other databases, all database tags shall be maximum of 30 characters.

For non PlantPax tag name standard is:

PPPP_EEENNNN_SSSSSSSSSSSSS_FF (30 Characters Maximum)

Where:

PPPP_ = Facility/Plant Code (4 or 5 Characters from table below)

EEE = Equipment Type Code (3 Characters Minimum as shown in Table 2)

NNNN_ = Equipment Number (4 Characters Minimum as shown in Table 2)

SSSSSSSSSSSSSS_ = Signal (15 or more Characters)

FF = Function Code (2 Characters Minimum)

On facilities that do not have P&ID for naming, a 3 or 5 character prefix (up to 4 letters/Numbers and an underscore) will be used on all tags. The prefix will identify the location of the Control System location. Use the table below to identify the location.

The Equipment Description (EEE) and associated codes for different types of assets used at a WWTP .

Example: P710_PMP1_RUNNING

Tag Plant Name Codes

PPPP-Plant	Code
Blue River WWTP Primary Treatment	P701
Blue River Secondary WWTP	P702
Blue River Chemical Storage	P703
Blue River WWTP Primary Solids	P710
Birmingham WWTP	P711
Westside WWTP	P712
Westside WWTP Disinfection	P713
Todd Creek WWTP	P715
Rockybranch WWTP	P718
Fishing River WWTP	P720
KCI De-Icing	P745

PPPP-Facility	Code
South West Blvd FS	P600
25 th St Flood Pump Station (FS)	P601
North Air FS	P604
Gillis FS	P606
Lydia FS	P607
Prospect FS	P608
Milwaukee FS	P609
Truman FS	P610
Hawthorne FS	P611
Blue Banks FS	P612
South Air FS	P614
Santa Fe PS	P617
Swope Industrial PS	P618
North Church PS	P619
Blue River Sec Effluent PS	P620
Pied Creek PS	P623
Second Creek PS	P628
First Creek PS	P627
Gooseneck PS	P635
South Air Relief Well PS	P637
Wild Wood West PS	P642
KCI Industrial PS	P643
Briarcliff West PS	P646
15 th & Crystal PS	P647

Line Creek PS	P648
Riverside PS	P649
Blue River PS	P651
Buckeye PS	P652
North Land Mobile PS	P657
NEID PS	P658
Chouteau Trwy PS	P659
Turkey Creek PS	P661
Riverside Horizons PS	P662
Birchwood PS	P663
12 th St PS	P667
Round Grove PS	P669
Trolley Trail Basin (DS-68)	P674
South Air PS	P676
118 th and Lawndale	P677
87 th St PS	P678
Lake Waukomis PS	P682
White Aloe PS	P684
Brush Creek PS	P686
Upper Rush PS	P687
Harlem PS	P688
Burlington Creek PS	P691
83 rd and Blue PS	P692
Birmingham PS	P693
Mace Rd PS	P694
Weatherby Lake PS	P696
Platte Woods PS	P697
Kemper FS	P699

Table 1 - Tag Name Plant Codes

Tag Equipment Type Codes

EEE-Equipment	Code
ACTUATOR	ACTU
AERATOR	AER
AIR COMPRESSOR	AIRC
BAR SCREEN	BS
BASIN	BAS
BATTERY BANK	BB
BATTERY CHARGER	BBC
BELT PRESS	BELTPR
BLOWER	BLOW
BUILDING	BLDG
CAMERAS/SECURITY/MONITOR	CAMSEC

CHEMICAL FEED	CHMF
CHEMICAL SILO/STORAGE	CSILO
CHEMICAL UNLOADING	CHMUN
CLARIFIER	CLAR
CLARIFIER MECHANISM	CLARM
COMMUNICATION	COMM
COMPUTER/SYSTEM	CMP
CONTAINMENT CHEM OR OILS	CONT
CONVEYOR	CONV
CRANE	CRN
DEHUMIDIFIER/AIR DRYER	DHAD
DIFFUSERS	DIF
DIGESTOR	DGST
DISTRIBUTION (Wiring etc)	DIST
EDDY CURRENT DRIVES	EDCD
ELEVATOR	ELEV
FILTER	FILT
FLOCCULATOR	FLOC
GATE-PROCESS	GATE
GENERATOR	GEN
GRIT REMOVAL EQUIPMENT	GRIT
GROUNDS	GRND
HOIST	HOIST
HVAC-Conveyance	HVACN
HVAC-Heating and cooling	HVAC
LABORATORY EQUIPMENT	LAB
LIGHTING	LIGHT
MACHINERY/TOOLS-FIXED	MACHFX
MANHOLE STRUCTURE	MH
MIXER	MIX
MONO RAIL	MRAIL
MOTOR	MTR
MOTOR (NON ELECTRICAL)	MTRNE
MOTOR CONTROL CENTER	MCC
OPERATOR INTERFACE TERMINAL/FIELD CONTROLS	OIT
OVERHEAD DOORS (TRUCKBAY)	OHD
PIPING-ABOVEGROUND	PIPAB
PIPING-SITE/CHANNELS	PIPCH
PLUMBING (non-process)	PLBG
PORTABLE/MOBILE EQUIPMENT	PORTEQ
PROGRAMMABLE LOGIC CONTROLLER	PLC
PUMP	PMP
PUMPS-MOBILE	PMPMB

PUMPING UNIT	PUNIT
ROOF	ROOF
SAFETY-LIFE	SAFE
SAMPLER	SAMPLE
SCALE SENSOR	SCALE
SCRUBBER-AIR	SCRAIR
SEAL WATER SYSTE	SWS
SECURITY ALARM	SEC
SENSOR/METERS	SENS
SLG COLLECTOR/SWEEP ASSEMBLY	SLGCOL
SOFT START	S
SUB STATIONS ELECTRICAL	SUBST
SWITCHGEAR	SG
TANK	TANK
TOOLS-POWER HAND	TOOLPW
TRANSFORMER	TRAN
TRICKLING FILTER	TFIL
TRICKLING FILTER DISTRIB ASSEM	TFILAR
ULTRAVIOLET EQUIPMENT	UV
UNINTERRUPTABLE POWER SUPPLY	UPS
VALVE	VLV
VERIABLE FREQUENCY DRIVE	VFD
VIBRATOR	VIBRAT
WATER ELEVATED TANK	WILTNK
WATER RESERVOIR	WRES

Table 2 - Tag Name Equipment Type Codes

Tag Function Codes

FF - Function	Code
Timer	TMR
Alarm	AL
Setpoint	SP
Feedback	FB
Fault	FLT
Available	AVE
Call	CALL
Runtime	RT
Command	CMD

Table 3 - Tag Function Codes

Other Abbreviations

ABV-Abbreviations	Code
Alarm	ALM
Auto	A
Add On Instruction	AOI
Add On Profile	AOP
Variable Frequency Drive	VFD
Closed	CLSD
Close	CLS
Command	CMD
Effluent	EFF
Failure	FAIL
Fail To Run	FTR
Fail To Stop	FTS
Fail To Open	FTO
Fail To Close	FTC
Gallons Per Minute	GPM
Hand	H
Influent	INF
Lagoon	LGN
Level	LVL
Manual	M
Millions of Gallons Per Day	MGD
Off	O
Open	OPN
Parts Per Million	PPM
Position	POS
Pressure	PSI
Programmable Logic Controller	PLC
Pump	PMP
Raw I/O Signals	RAW
Remote Terminal Unit	RTU
Reset	RST
Required	RQD
Running	RUNNING
Scaled I/O Signals	SCL
Speed	SPD
Temperature	TMP
Timer	TMR

Torque High	TQH
Torque High High	TQHH
Total	TTL
Warning	WARN

Table 4 – Other Abbreviations

Security

HMI

HMI security is provided at the Domain level – Domain level through Microsoft Active Directory. The Active Directory and Domain is separate from the KCMO Water Services Domain.

The first level of security is at the operating system level and will be in accordance with the KCMO Wastewater computer security requirements.

HMI user names and passwords are required that define user privileges maintained in the Active Directory. Each HMI user will have a unique password which will be maintained by the KCMO Wastewater department or preferred qualified Admin. Each user will be assigned to one of the following security groups. The following user groups and associated privileges will be used:

Security Group	Security Area	Application Feature	Privileges Groups A-G	Typical nonuse Auto Logoff Time
Administrator	Area01_Basic Area01_Advanced	View Only	G	30 Minutes
Engineering	Area01_Basic Area01_Advanced	AlarmAck/ AlarmConfig/ AlarmDisable/ AlarmShelve/ BypassFeedback/ BypassInterlocks/ CmdSrcMaint/ CmdSrcOperProg/ CmdSrcOutOfService/ ConfigSecurity/ DeviceConfigBehavior/ DeviceConfigDiagnostics/ DeviceConfigFailTimers/ DeviceConfigHMI/ DeviceConfigLimits/ DeviceConfigThresholds/ DeviceConfigTimers/ DeviceConfigTuning/ EnableSimulation/ EnterOperSettings/	E	30 Minutes

		OperateEquipment/ OverrideInputs/ OverrideOutputs/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ ResetAccumulators/ RespondToPrompts/ ShowFaceplates.		
Maintenance	Area01_Basic Area01_Advanced	AlarmAck/ AlarmDisable/ AlarmShelve/ BypassFeedback/ BypassInterlocks/ CmdSrcMaint/ CmdSrcOperProg/ CmdSrcOutOfService/ DeviceConfigDiagnostics/ DeviceConfigThresholds/ EnterOperSettings/ OperateEquipment/ OverrideInputs/ OverrideOutputs/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ ResetAccumulators/ RespondToPrompts/ ShowFaceplates.	C	30 Minutes
Maintenance Supervisor	Area01_Basic Area01_Advanced	AlarmAck/ AlarmDisable/ AlarmShelve/ BypassFeedback/ BypassInterlocks/ CmdSrcMaint/ CmdSrcOperProg/	D	30 Minutes

		CmdSrcOutOfService/ DeviceConfigDiagnostics/ DeviceConfigFailTimers/ DeviceConfigLimits/ DeviceConfigThresholds/ DeviceConfigTimers/ DeviceConfigTuning EnterOperSettings/ OperateEquipment/ OverrideInputs/ OverrideOutputs/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ ResetAccumulators/ RespondToPrompts/ ShowFaceplates.		
Manager	Area01_Basic Area01_Advanced	AlarmAck/ AlarmDisable/ AlarmShelve/ BypassInterlocks/ CmdSrcOperProg/ DeviceConfigThresholds/ EnterOperSettings/ OperateEquipment/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ RespondToPrompts/	F	30 Minutes
Operating Supervisor	Area01_Basic Area01_Advanced	AlarmAck/ AlarmDisable/ AlarmShelve/ BypassInterlocks/ CmdSrcOperProg/ DeviceConfigThresholds/ EnterOperSettings/	B	30 Minutes

		OperateEquipment/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ RespondToPrompts/		
Operators	Area01_Basic Area01_Advanced	AlarmAck/ AlarmShelve/ EnterOperSettings/ OperateEquipment/ ProcedureControl/ ProcedureExceptions/ ProcedureManualControl/ RespondToPrompts/	A	30 Minutes

Table 14 - PlantPax HMI Security Configuration

OIT

OIT security is provided at two levels – (Local Access and Windows Users/Active Directory from respective Domain Controller (DC) Server)

Local access is to the OIT level through OIT Login. Typical (User Name: admin) (Password: Facility Number) Each OIT will have the same user security groups as each other and as the HMI.

KCMO will have one DC for the entire system. All other sites will access that DC and its active directory. If a site loses communication or is not directly connected to the network, it will continue to run via onsite with a back up DC using last connected information. If local edits are made at the back up DC, they will be received by the central DC when reconnected.

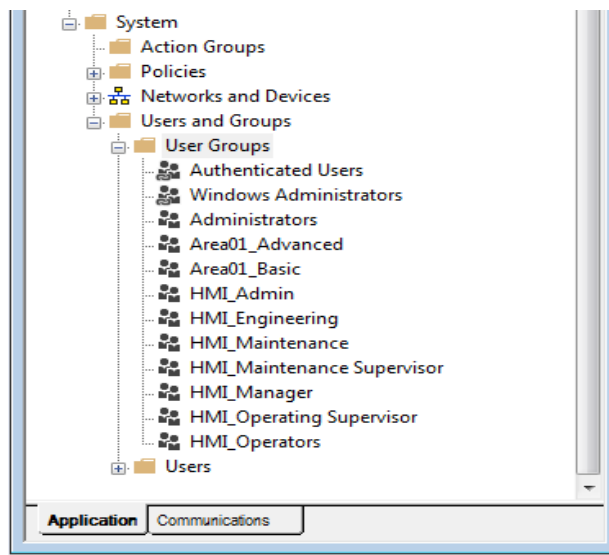


Figure 1 – User Groups

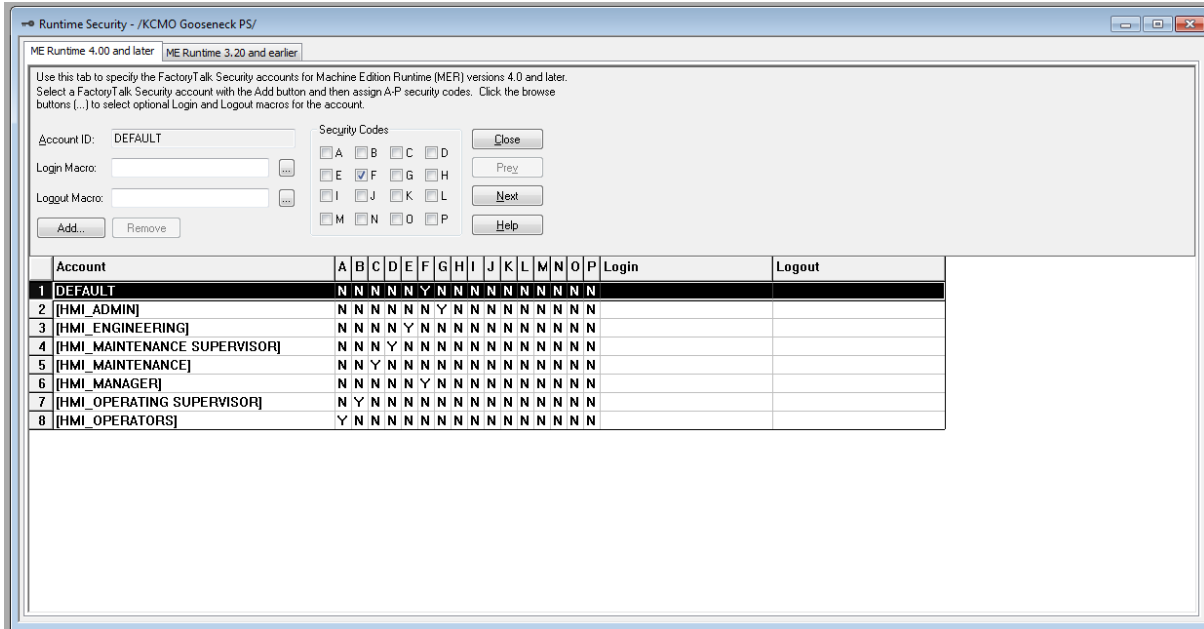


Figure 2 – Runtime Security

Application/Display Names

HMI

Application Name in FactoryTalk View Studio – View Site Edition that contains configuration information for the Application System Settings, Graphics Displays, Alarm Setup, Communication Setup, System Policies, Networks and Devices, Users, and Groups. Using standard names will ensure that the files are organized.

Application Name

HMI Application name standards. Using standard names will ensure that the files will be organized.

The application name can be up to 32 characters long, and must be unique to the application. The application file is given the extension .sed. Applications will be Archived using the Rockwell Software Factory Talk View SE Application Manager “Backup application” program. This Archive will be named the same as the Application with a .apb extension.

The HMI names for KCMO Wastewater will need to adhere to a 11 character limit. The HMI name will begin with the customer code “KCW-P” and “PPP” (Name of the Facility)

Examples:

- KCW-PPP
- KCW-P710
- KCW-P720
- KCW-P712
- KCW-P718
- KCW-P715

Main Process Screens

Each file name will begin with a prefix of the Integrator code III_ proceeded by Site Name code PPP_. The file will then contain a descriptive filename for the area it depicts. Definition of an Integrator Code would be the name of the company in three digits. Code III example (R.E. Pedrotti Company - REP)

Examples:

III_PPP_Home (REP_BRT_Home)	Site Home Screen (Level 1)
III_PPP_Overview (REP_BRT_Overview)	Site Overview (Level 2)
III_Alarm_Summary (REP_Alarm_Summary)	Alarm Summary
III_PPP_Cent_Home (REP_BRT_Cent_Home)	Centrifuge Home Screen (Level 1)
III_PPP_Cent_Overview (REP_BRT_Cent_Overview)	Centrifuge Overview (Level 2)

Faceplates

Each Faceplate for each equipment will be called from the AOI as long as the naming convention is followed in Studio5000.

Shortcuts

All Shortcuts for the HMI/OIT/Historian/Data Log/etc have the same naming convention.

Examples:

P648PMPLC01 (Line Creek Pump Station PLC)
P652PMPLC01 (Buckeye Pump Station PLC)
P635PMPLC01 (Gooseneck Pump Station PLC)
P669PMPLC01 (Round Grove Pump Station PLC)

OIT

Application Name in FactoryTalk View Studio – View Machine Edition that contains configuration information for the PanelView’s System Settings, Graphics Displays, Alarm Setup, Communication Setup, System Policies, Networks and Devices, Users, and Groups. Using standard names will ensure that the files are organized.

Application Name

The application name can be up to 32 characters long, and must be unique to the application. The application file is given the extension .med. Applications will be Archived using the Rockwell Software Application Manager “Backup application” program. This Archive will be named the same as the Application with a .apa extension.

The OIT names for KCMO Wastewater will need to adhere to a 11 character limit. The OIT name will begin with the customer code “KCMO_” and “PPP” (Name of the Facility) and then the facility type “FFFF” PS (Pump Station), FS (Flood Station).

Example:

KCMO PPP FFFF
KCMO Gooseneck PS

KCMO RoundGrove PS
KCMO LineCreek PS

Tags

Use Direct Reference tags for two reasons,

1. To save memory in the FTView ME application. The PlantPax Global Objects, Displays, and Images will take up most of the memory.
2. When converting from ME to SE only the Global Objects on the graphic screens will need to be swapped out for the SE version.

Displays

Each file name will begin with a prefix of the Integrator code III_ proceeded by Site Name code PPP_. The file will then contain a descriptive filename for the area it depicts.

Examples:

III_PPP_Home (REP_BRT_Home)	Site Home Screen (Level 1)
III_PPP_Overview (REP_BRT_Overview)	Site Overview (Level 2)
III_Alarm_Summary (REP_Alarm_Summary)	Alarm Summary
III_PPP_Cent_Home (REP_BRT_Cent_Home)	Centrifuge Home Screen (Level 1)
III_PPP_Cent_Overview (REP_BRT_Cent_Overview)	Centrifuge Overview (Level 2)

Faceplates

Each Faceplate for each equipment will be called from the AOI as long as the naming convention is followed in Studio5000.

OIT FTView ME Application Settings

Project Settings

Runtime/Auto Log Out,

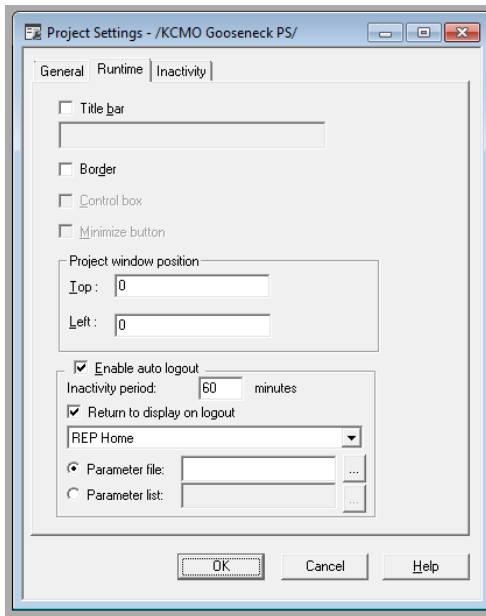


Figure 3 – Project Settings

Diagnostics List Setup

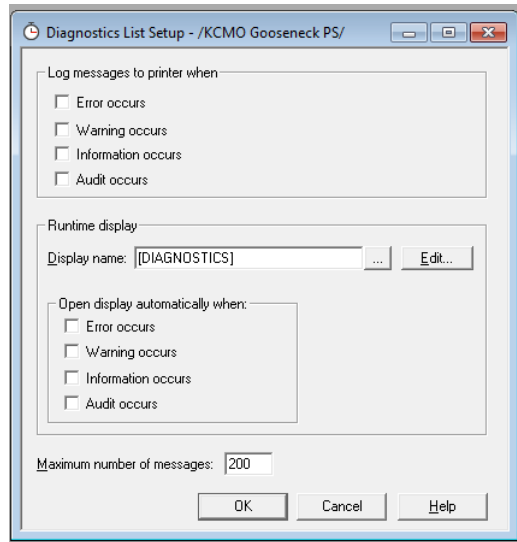


Figure 4 – Diagnostics List Setup

Global Connections

Global Connections will be used for

Date and Time

Updating OIT system Date/Times from associated PLC

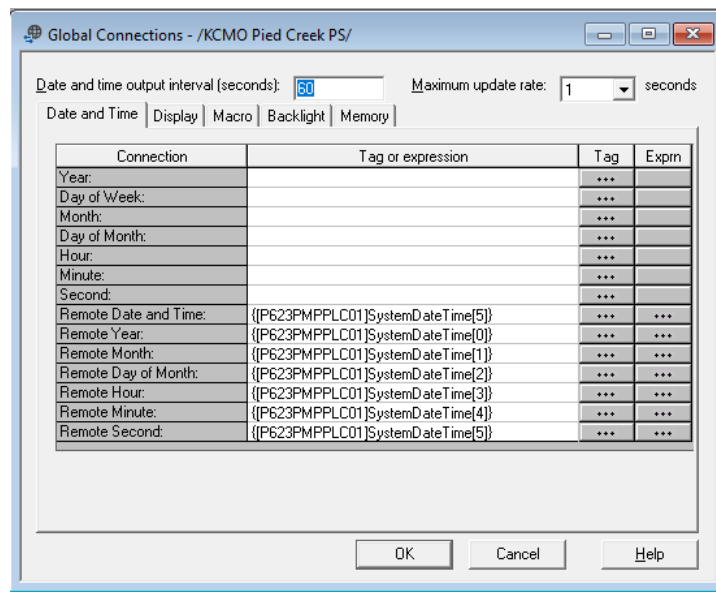


Figure 5 – Global Connections/Date and Times

Display

Remote Display Number call, Tag name “RemoteDisplayTag” This used for calling a certain display for Data Logging to a USB stick.

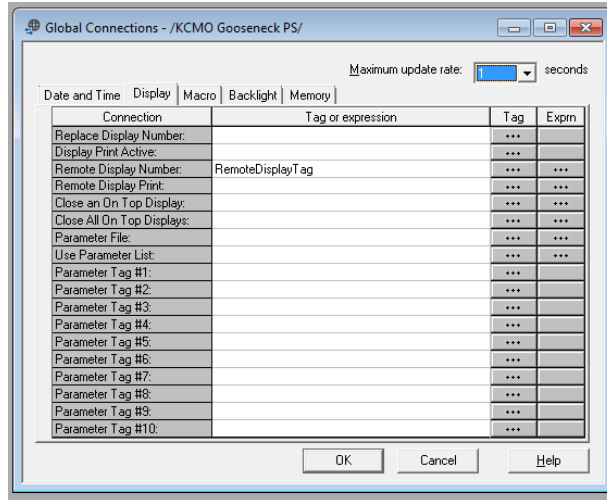


Figure 6 – Global Connections/Display

Startup

Start the following, Alarms/Data logging/Initial graphic displays.

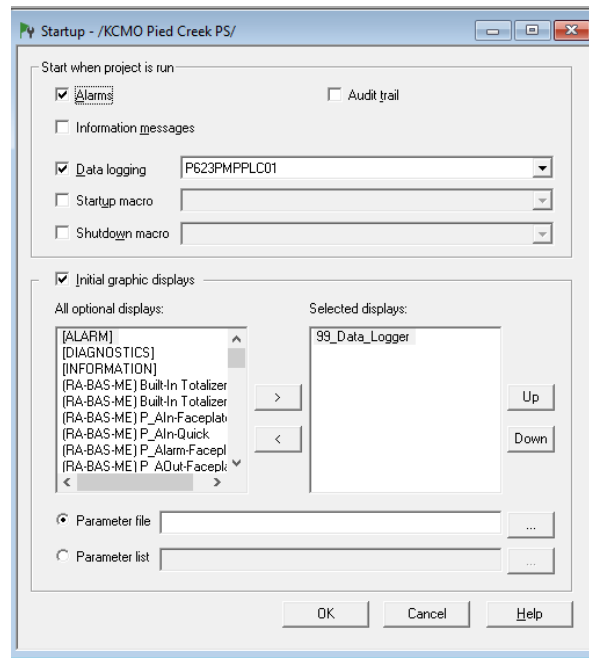


Figure 7 – Startup

Datalogging to a USB

Import the “99_Data_Logger” screen,

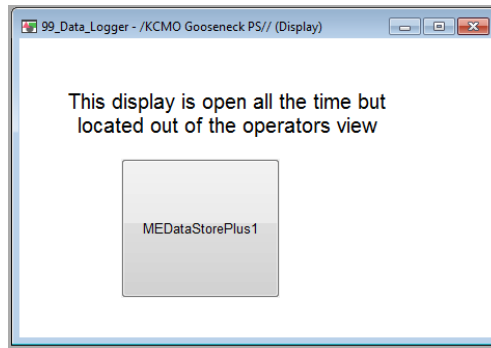


Figure 8 – Datalogging to a USB

Check Display Settings “General” Tab is set as follows,

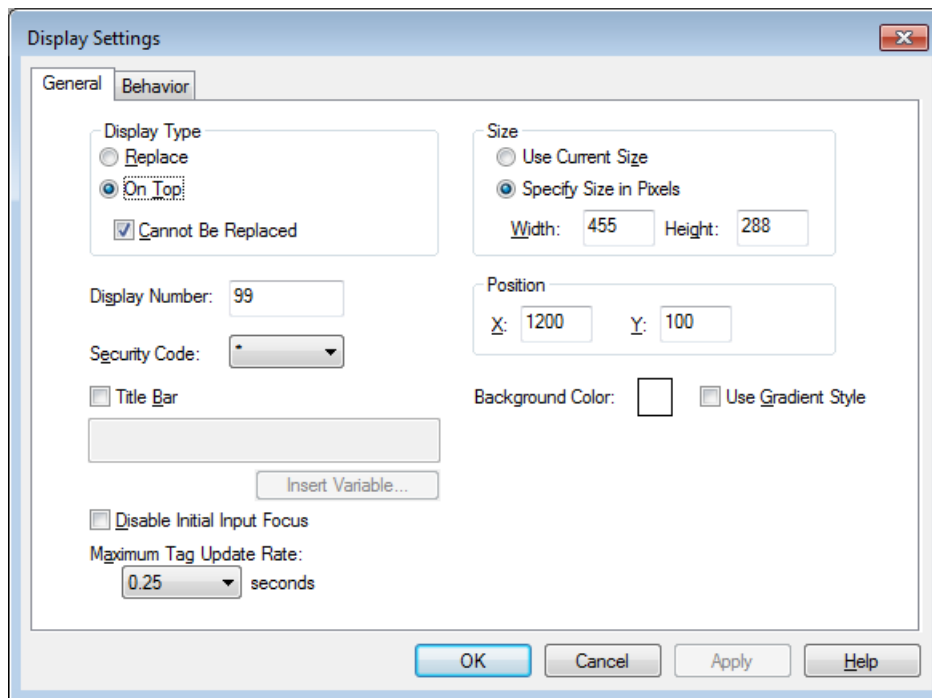


Figure 9 – Display Setting/General

Check Display Settings “Behavior” Tab is set as follows,

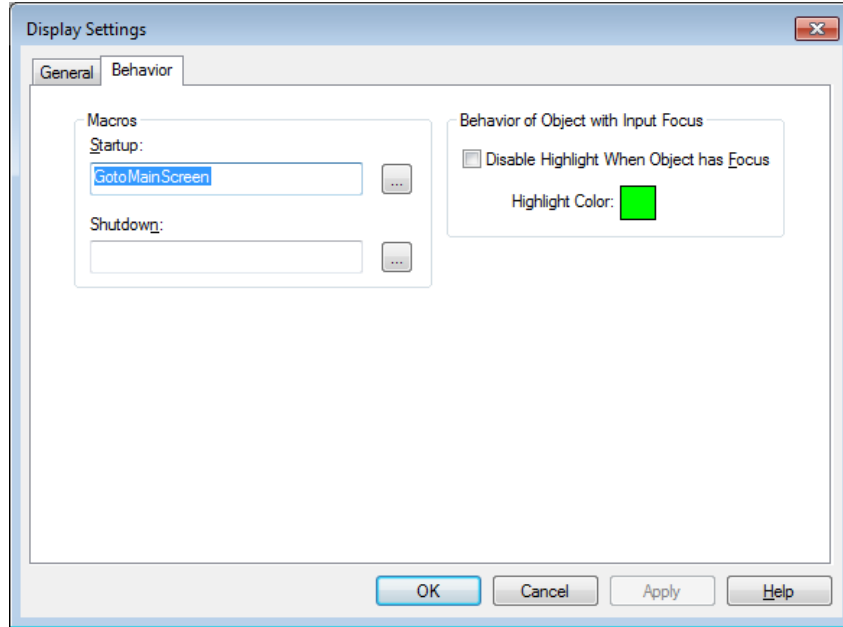


Figure 10 – Display Setting/Behavior

ME DataStore Plus Properties

Check “General” Tab is set as follows,

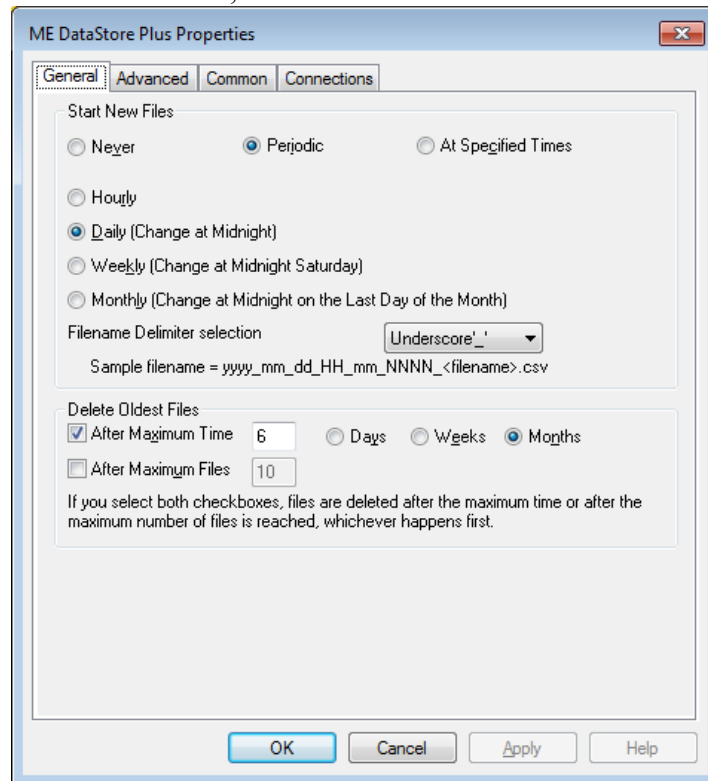


Figure 11 – ME DataStore Plus Properties/General

Check “Advanced/Common” Tabs is set as follows,

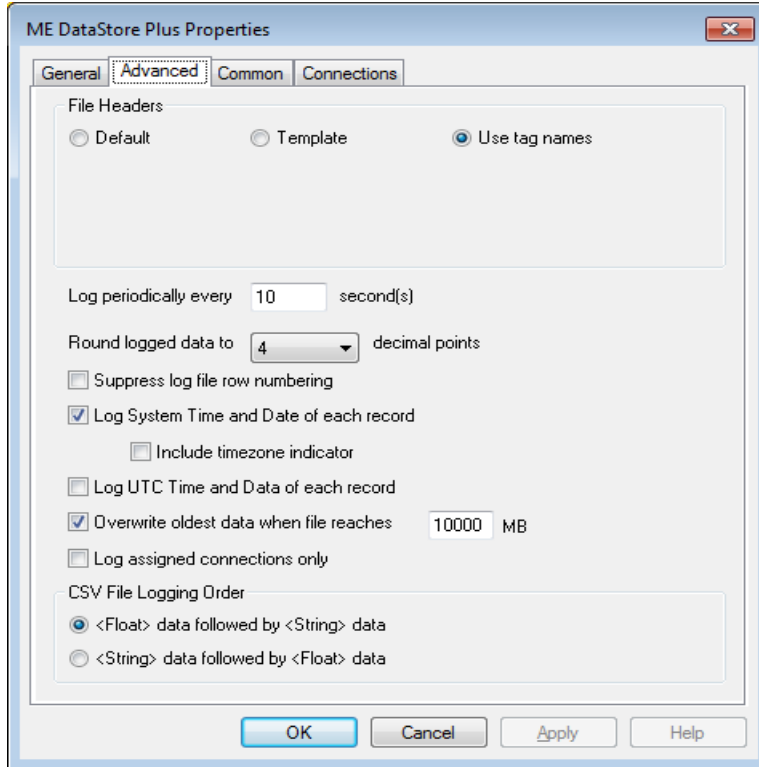


Figure 12 – ME DataStore Plus Properties/Advanced

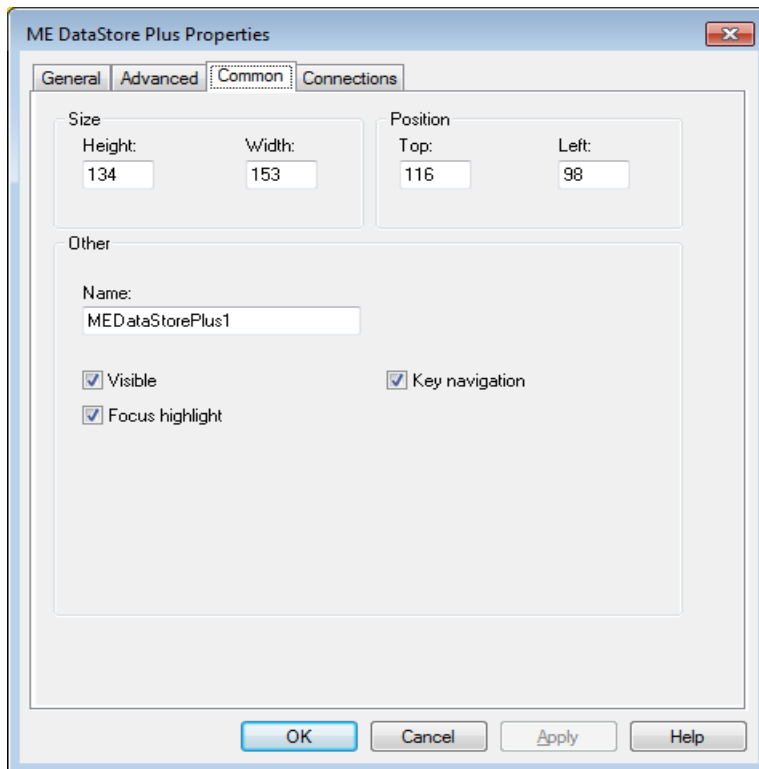


Figure 13 – ME DataStore Plus Properties/Common

Connections Tab

This is where tags are added for writing to a USB into an Excel spreadsheet.

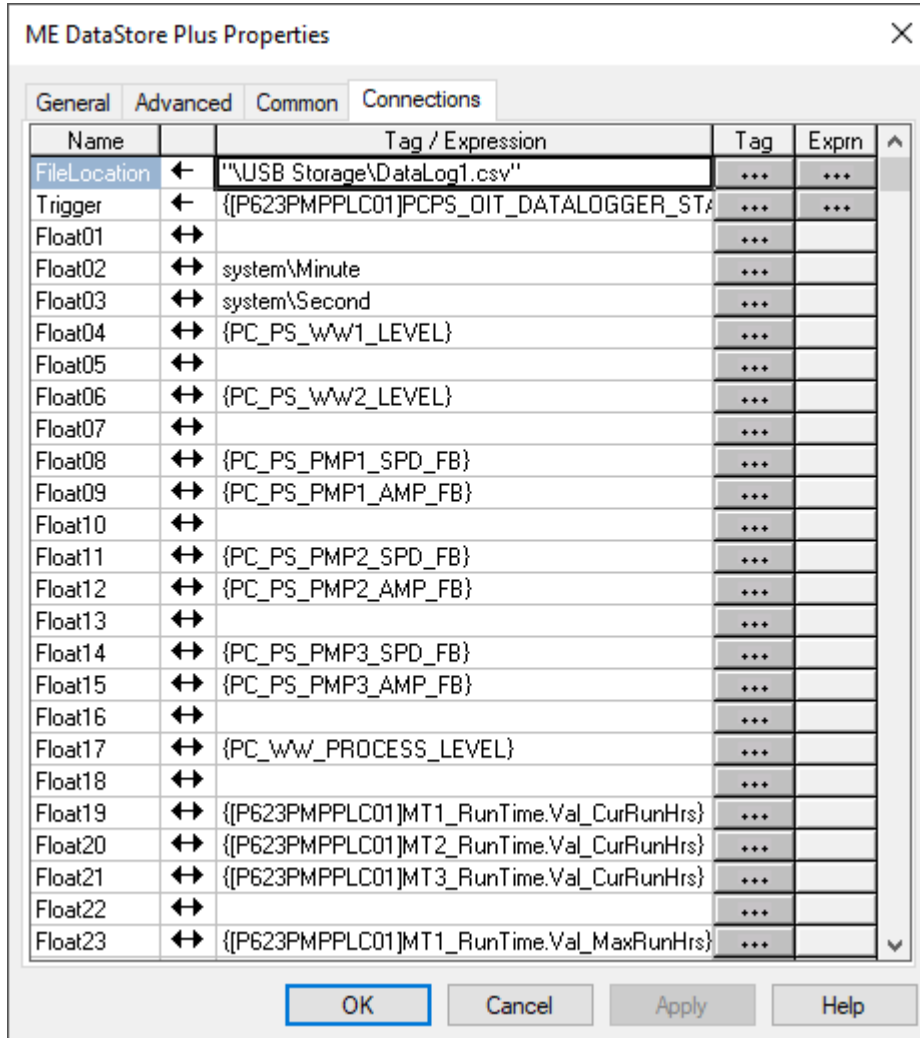


Figure 14 – ME DataStore Plus Properties/Connections

Controller Tag in the PLC for starting the Data Logger. This tag is always true.

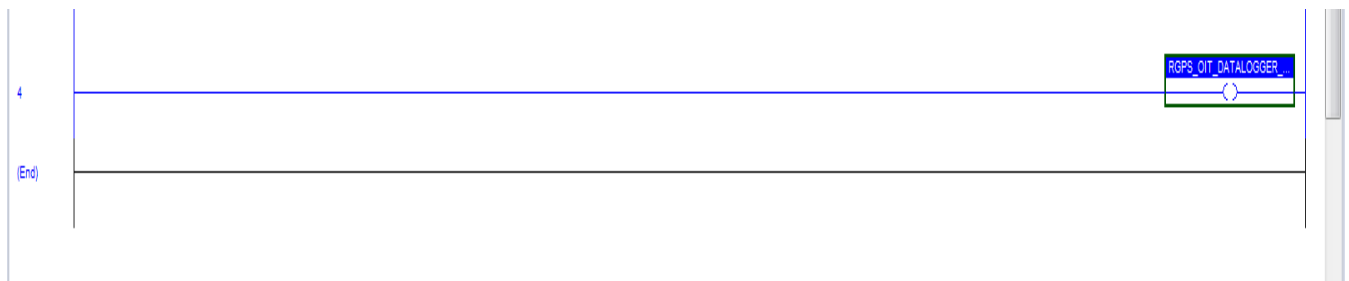


Figure 14a – PLC DataLogger Start Tag

Macro

GotoMainScreen,

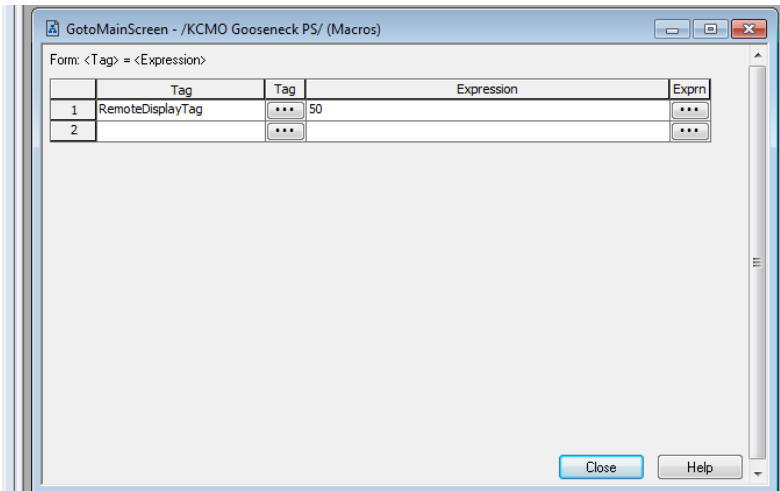
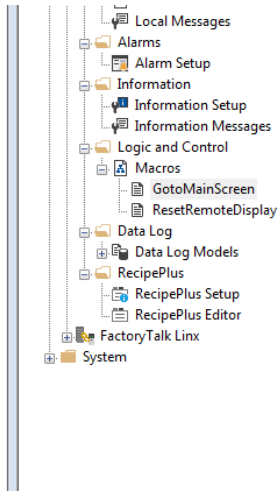


Figure 15 – Macro/GotoMainScreen

ResetRemoteDisplay,

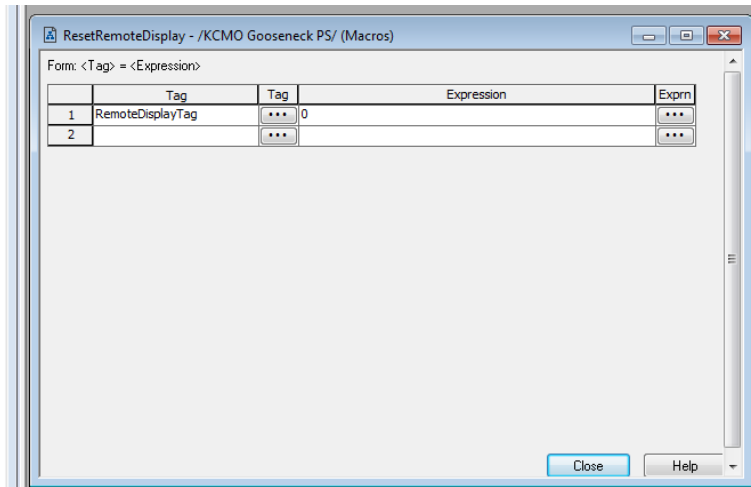
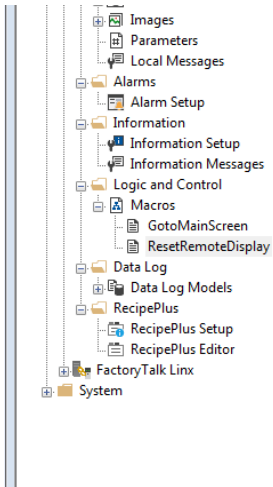


Figure 16 – Macro/ResetRemoteDisplay

Data Log

Set “Setup” Tab with the following format,

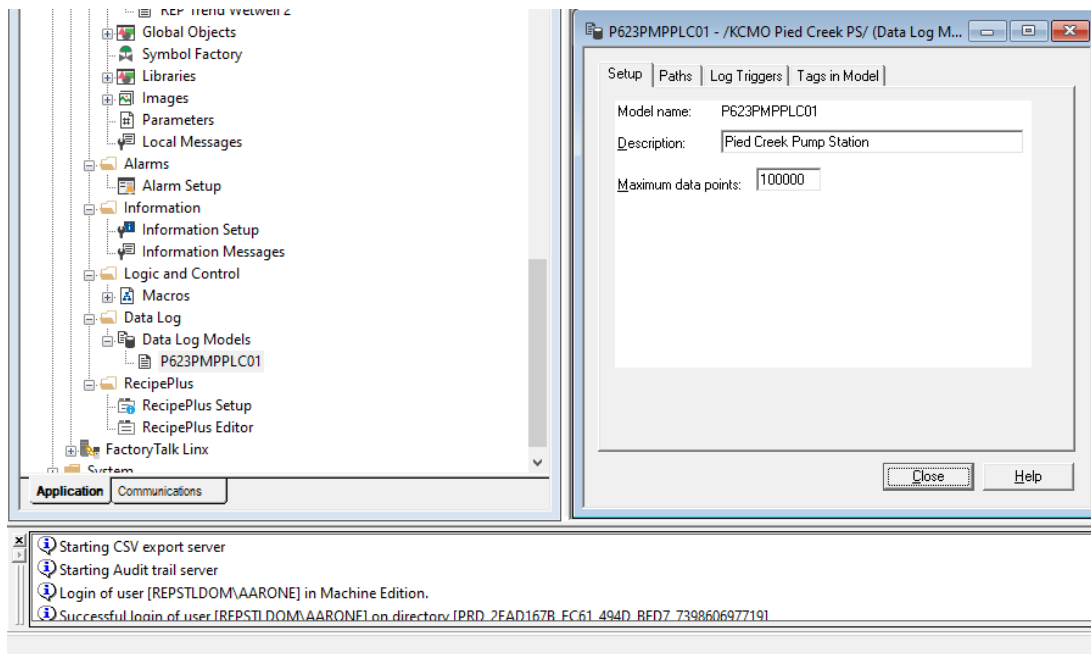


Figure 17 – Data Log/Setup

Set “Paths” Tab with the following format,

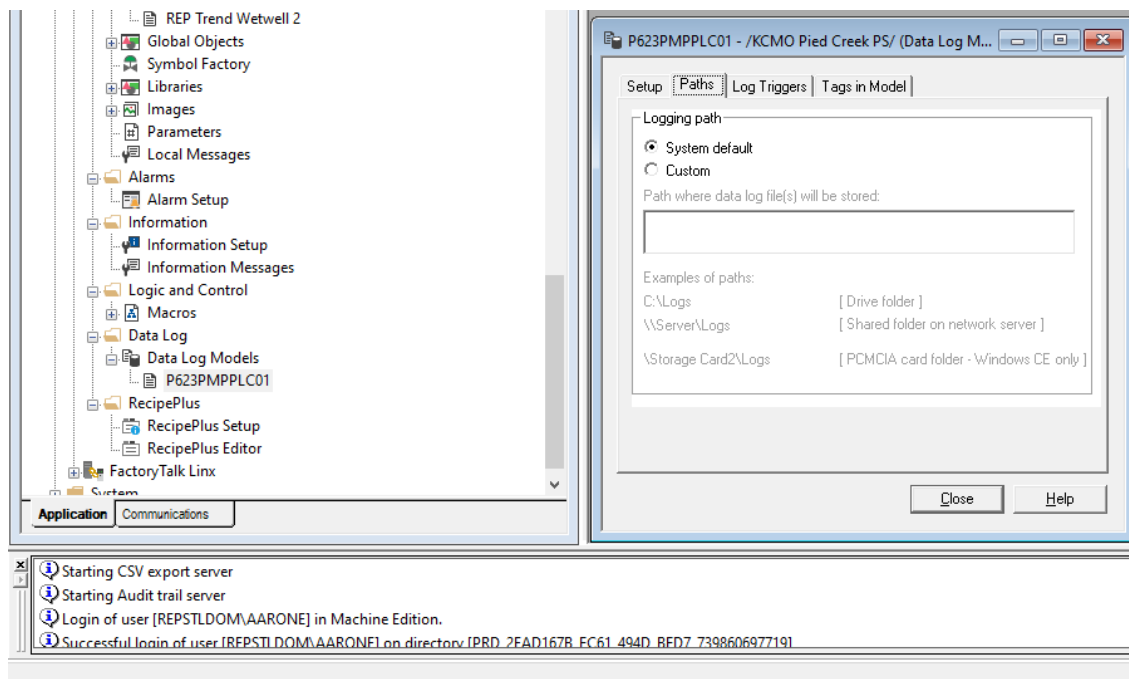


Figure 18 – Data Log/Paths

Set “Log Triggers” Tab with the following format,

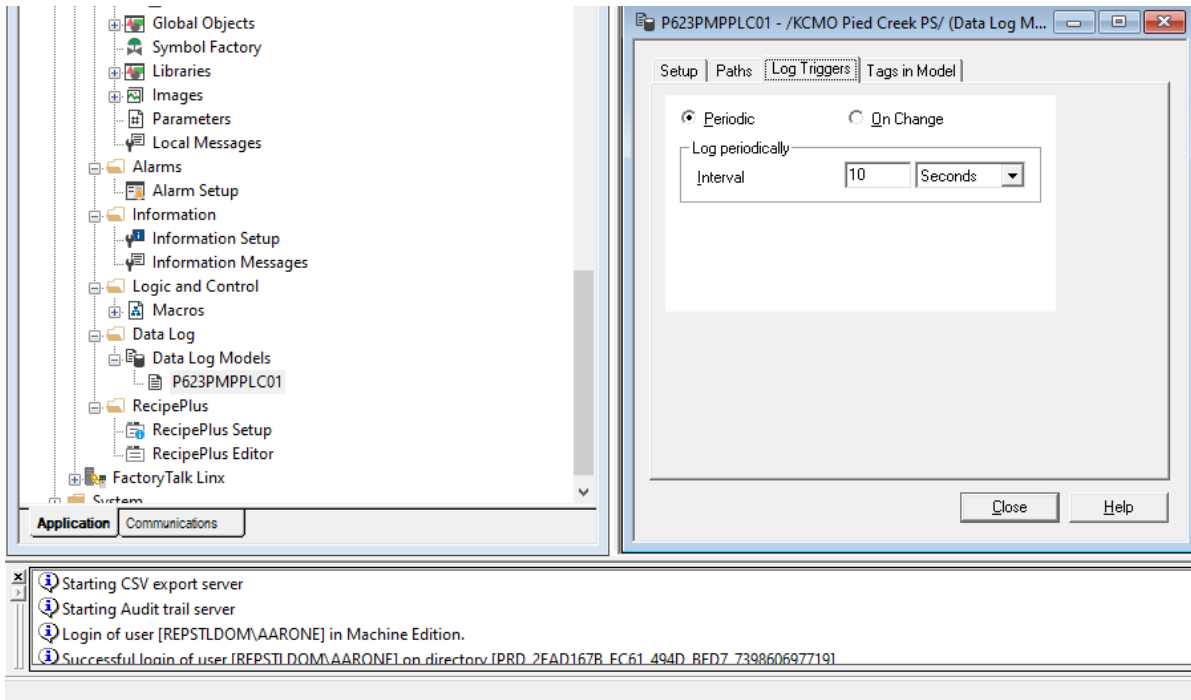


Figure 19 – Data Log/Log Triggers

Set “Tags in Model” Tab with the following format, (Max of 100 Tags for a FTVIEW ME Data Logger)

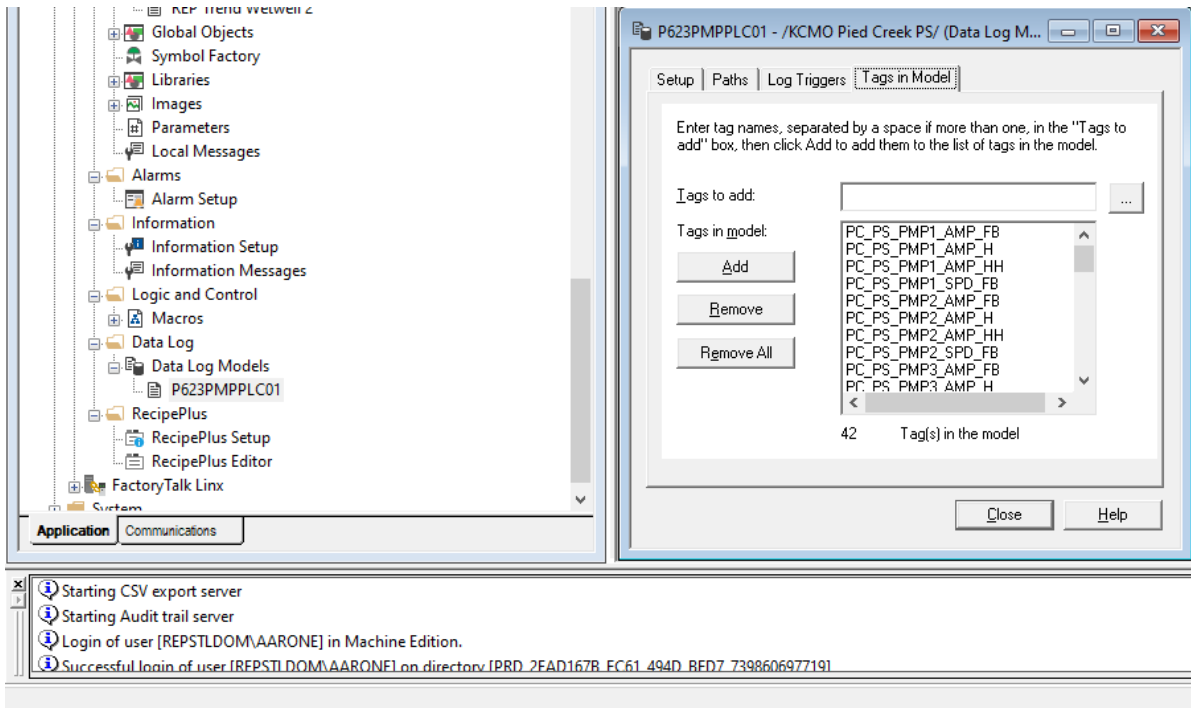


Figure 20 – Data Log/Tags in Mode

PLC

The ControlLogix PLC program is kept in 1 file with extension Name.ACD. Names cannot contain two contiguous underscore characters.

The PLC names will need to adhere to a 20 character limit. The PLC name will begin with the site name “PPP_” and then the facility type “FFFF” PS (Pump Station), FS (Flood Station).

The PLC name standard is:

PPPPFFFPLC01 (20 Characters Maximum)

Where:

PPPP_ = Site Number

FFF = Process, PMP (Pump), SCR (Screen)

Examples:

P635PMPPLC01 Gooseneck Pump Station

P648PMPPLC01 Line Creek Pump Station

P609PMPPLC01 Milwaukee Flood Station

If a Data Concentrator PLC is needed it will have this format:

PPPIIFFPLC01 (20 Characters Maximum)

Where:

PPP_ = Site Number

II_ = (PP) PlantPax

FF = DC (Data Concentrator)

Examples:

P710PPDCPLC01 Blue River WWTP PlantPax Data Concentrator

P805PPDCPLC01 North Oak Tower PlantPax Data Concentrator

Thin Clients

Each Thick or Thin Client computer on a network is known as a “Remote Desktop”. All clients on Thin Manager network must have unique names. Client names will not be the same name as the Microsoft computer name. Client names can be up to eighteen characters long. They can include alphanumeric characters but must begin with a letter. Special characters cannot be used. Client names will use the following convention.

The Client name standard is:

PPPPEEE##### (18 Characters Maximum)

Where:

PPPP = WW(Facility Number)

EEE = OWS, (Designates Operator Work Station)

= 01, Designates the number of the client

Client Name Examples:

WW710OWS01 Operator Work Station No.1

WW710OWS02 Operator Work Station No.2

PC Microsoft computer name (Thick Clients only)

This naming convention only relates to existing hardware at the KCMO Blue River WWTP that are classified as Thick Clients. Unlike Thin Clients Thick Clients have an Operating System as in Windows 10. All new hardware are Thin Clients. Thick Client names can be up to eighteen characters long. They can include alphanumeric characters but must begin with a letter. Special characters cannot be used. Thick Client names use the following convention.

Where:

PPPP = BRWWTP, Facility Name.

EEE = OWS, (Designates Operator Work Station)

= 01, Designates the number of the client

Client Name Examples:

BRWWTP-OWS01 Blue River WWTP Operator Work Station No.1

BRWWTP-OWS02 Blue River WWTP Operator Work Station No.2

For new Thick Clients the naming convention refer back to the Thin Client naming convention.

HMI & OIT Screen Design

The following section will describe the design parameters used for HMI development.

HMI Screen Resolution

All HMI screens will use a resolution of 1920 x 1080

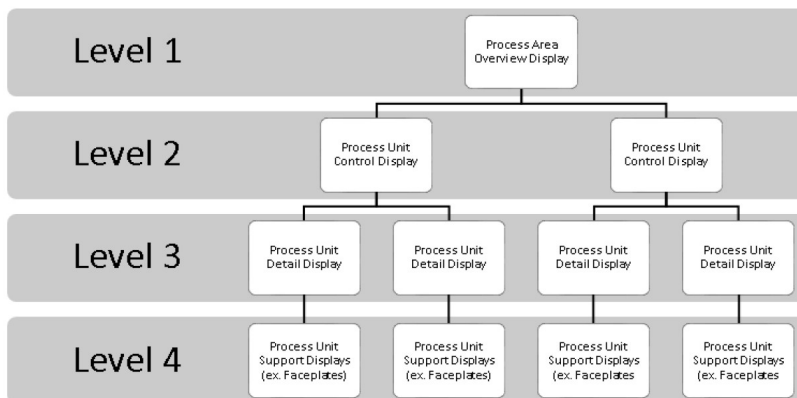
1 Display Levels

Understanding the users' goals, tasks, and mental model is crucial to determining the organization of the displays in an HMI project. They should be organized for the primary user as identified in user research. In most cases this is the operator. Secondary users need to be considered as well, but the information they need can be provided on separate displays or workstations.

The hierarchy and organization of the displays should be created to provide progressive disclosure of information. A clean, simple display with an overview of the operations should lead to other displays that contain more complexity and detail as users navigate deeper into the hierarchy. Using this methodology provides a quick look and allows the user to initiate the action of diving deeper for more information rather than having it clutter the initial display. There are four levels that are recommended for the display hierarchy, each level providing more detail than the previous level.

Each screen to have a facility header code and name.

Example (710 – Blue River WWTP Primary Solids)



Level 1: Overview Display

Provides an overview of the operator's entire span of responsibility.

Level 2: Process Unit Control Display

Operator's primary operating display. Used during normal operations, routine changes, and monitoring.

Level 3: Process Unit Detail Display

Non-routine operations. Provides sufficient information to facilitate process diagnostics.

Level 4: Process Unit Support Display

Interlocks, Diagnostics, Help, and Documentation; delivered on faceplates or popup displays.

1.1 Level 1 Displays: Process Overview

Level 1 displays contain high-level overview information that can be assimilated quickly, provide clear indication of current performance, and highlight anything that requires immediate attention. Control should not be performed from this display.



Example Level 1 display

Level 1 displays contain the following types of elements:

- High-level Key Performance Indicators (KPI)
- Alarms of top 2 or 3 highest priorities
- Important calculated parameters and conditions
- Important information from upstream and downstream units
- Advanced control mechanisms performance and status
- Major equipment status
- Appropriate trends of important parameters
- Indications of abnormal situations, denoting severity

There should only be one overview display for a specific operating position; however, there may be different ones for different modes or process changes such as batch.

Level 1 displays are crucial as they provide contextual information; however, they may not contain all information users need to perform their jobs. Instead, they provide current state of operations, indications of abnormal situations that may be occurring, and quick and easy access to additional information.

Level 1 displays should be designed secondarily to Level 2 displays.

1.2 Level 2 Displays: Process Unit Operating Graphics

Level 2 displays are the primary displays used for operators to perform their tasks and should be designed first. Level 2 displays should match the users' mental model of the machine and operation and provide easy access to related displays in the display hierarchy. There may be multiple Level 2 displays for the same equipment to cover specific situations such as startup, normal operation, state or product transitions, and shutdown.



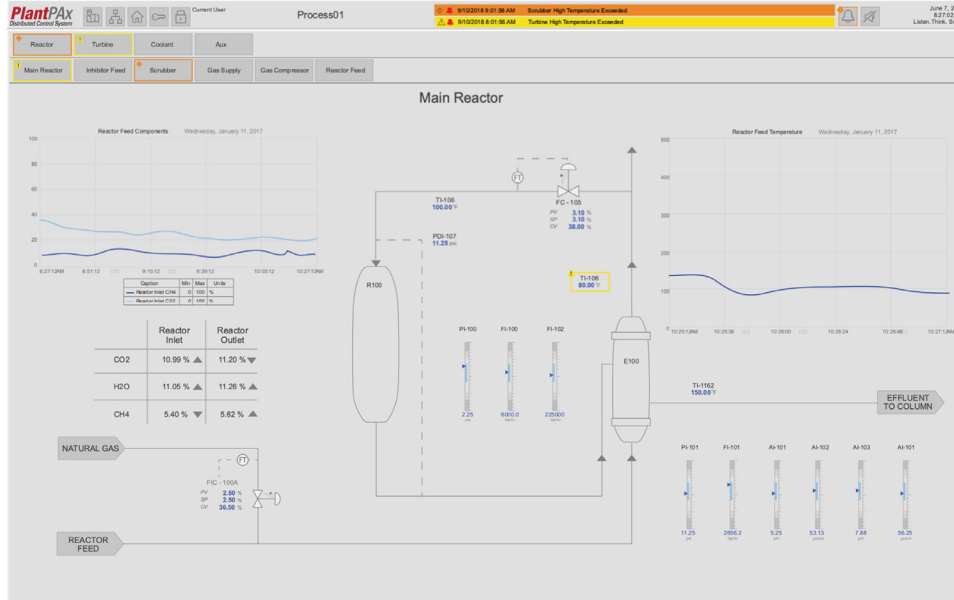
Example Level 2 display

Level 2 displays contain the following types of elements that are relevant to the tasks to be accomplished by that display:

- Key Performance Indicators (KPI)
- All alarms relevant to this display (if constrained by space, then alarms of top 2 or 3 highest priorities with indication there are additional alarms not being displayed)
- Controls needed to accomplish tasks (or access to controls, such as easy access to faceplates that contain controls)
- Indicators needed to accomplish tasks
- Navigation to related displays
- Navigation to overview display
- Navigation for continuation of flow lines
- Indications of abnormal situations, denoting severity

1.3 Level 3 Displays: Process Detail Displays

Level 3 displays contain much more detail and controls. They contain detailed view of sub-units, individual equipment items, components, and their related controls and indications. They are used for detailed investigations and interventions and are intended primarily for troubleshooting or manipulating items not accessible from Level 2 displays.



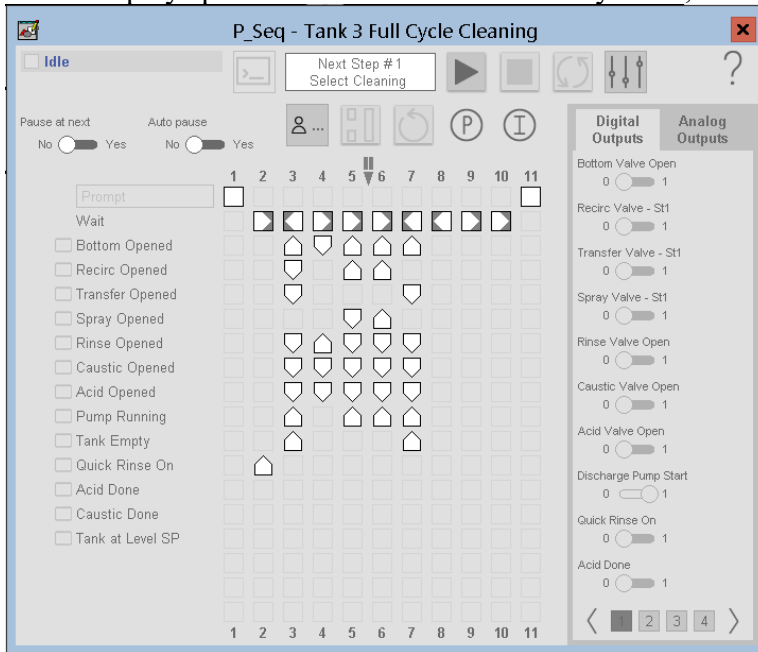
Example Level 3 display

Level 3 displays contain the following types of elements that are relevant to the tasks to be accomplished by that display:

- Alarms of all priorities relevant to that display
- Controls
- Indicators
- Detail view of equipment

1.4 Level 4 Displays: Process Support and Diagnostics Displays

Level 4 displays provide the most detail of subsystems, individual sensors, or components.



Example Level 4 display

Examples include:

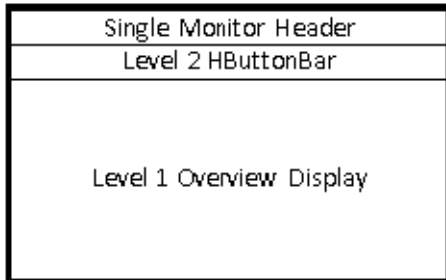
- Alarm displays with details of individual sensor status
- Detailed info about equipment and instrumentation
- Detailed status of Advanced Process Control functionality
- System-supplied displays such as point detail, system diagnostics, alarm summary, etc.
- Help displays
- Operating procedures
- Alarm documentation and response guidance

2 Standard HMI Template

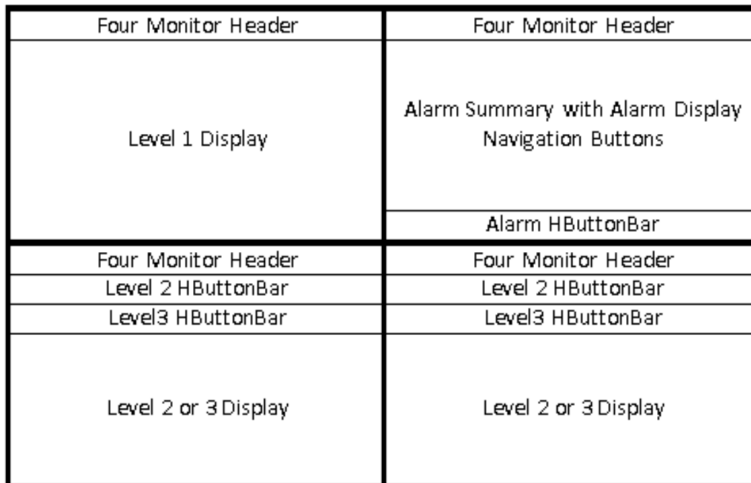
Rockwell Automation provides a configurable PlantPAx HMI template that can serve as a starting point for developing a new project. Templates are applied in Studio 5000 Architect and used in FactoryTalk View SE to build an HMI application. Multiple monitors are supported in the template, allowing you to implement displays on a single- or four-monitor workstation. For more information on this template, visit publication PROCES-UM003 (*PlantPAx Distributed Control System Application Configuration*) or download from the Rockwell Automation Product Compatibility and Download Center (PCDC).

2.1 Layout

The single monitor HMI template configuration is below. Users view, control, and navigate from one display.



The following image is of a four monitor HMI template configuration.

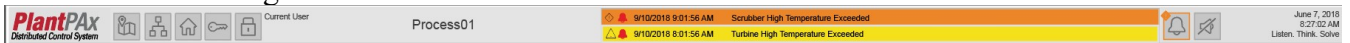


A four monitor widescreen layout with 1920x1080 screen resolution is utilized in the standard template. Level 1, Level 2, and Level 3 displays are provided as a part of the template along with navigation objects that promote display invocation from one monitor to another. Alarms and trends can be filtered as a part of the display yoking when a process area is changed from the navigation on the Level 1 display.

The HMI template requires that displays and alarms be organized using the Display Levels outlined in Section 3 of this document. For each display level, the HMI template provides not only the display framework, but also global objects that can be used. Navigation menus and headers for both one- and four-monitor configurations are also provided.

2.1.1 Header

Headers contain functionality that provides access to information. The HMI template includes headers for both a single monitor client and a four-monitor client.

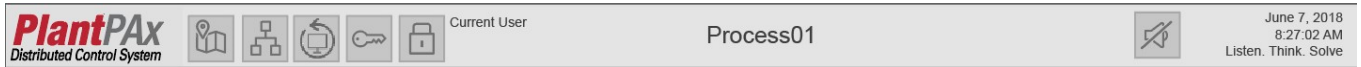


Single Monitor Header

This header includes the following components:

- Display Navigation Map
- System Status
- Return to Home Screen Button
- Client Login/Logout Buttons

- Alarm and Event Banner
- Alarm Access
- Alarm Silence



Four Monitor Header

The four monitor header includes the same buttons as the single monitor header except for the alarm access button. Another difference is in the lack of an alarm and event banner. Instead, the alarm summary is continuously displayed on monitor 2. Lastly, the four monitor header includes a “Refresh all Monitors” button instead of the “Return to Home Screen” button.

2.1.2 Button Bars

The level 2 Button Bar is used for navigating through level 2 displays.



The level 3 Button Bar is used for navigating through level 3 displays.



The button bars change based on context. For example:

- If users change the Process Area, then Level 2 buttons will display the Level 2 displays for that Process Area
- If users change a Level 2 display, it will display buttons for Level 3 displays relevant to that Level 2

For a single-monitor configuration:

- Level 2 button bar appears on Level 1, Level 2, and Level 3 displays
- Level 3 button bar appears on Level 2 and Level 3 displays.

For a four-monitor configuration:

- Level 2 button bar only appears on Level 2 and Level 3 displays
- Level 3 button bar also appears on Level 2 and Level 3 displays.

2.1.3 Level 1 Display

The Level 1 display in the HMI template is used as an Overview Display as described in 3.1 of this document:

- For a single monitor configuration, the Level 1 display contains a header and Level 2 buttons
- For a four-monitor configuration, the Level 1 display contains only a header.

2.1.4 Level 2 and 3 Displays

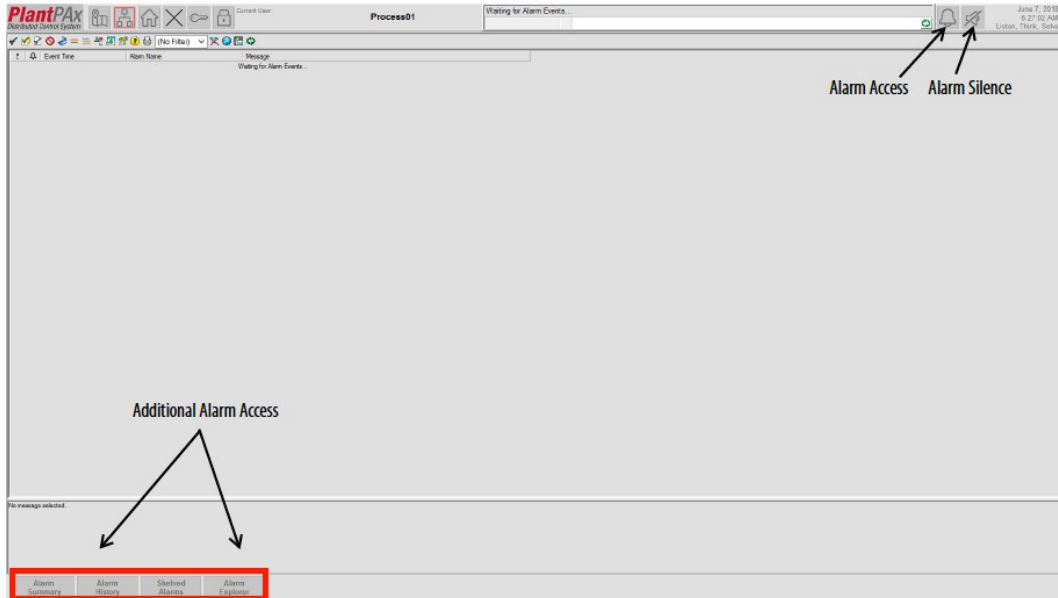
The HMI template display can be used for Level 2 and Level 3 displays. Level 2 displays are the main displays to perform tasks as described in 3.2 of this document. Level 3 displays are used when additional detail or controls are required as described in 3.3 of this document.

- For a four-monitor configuration, monitors 3 and 4 display the Level 2 and Level 3 displays.

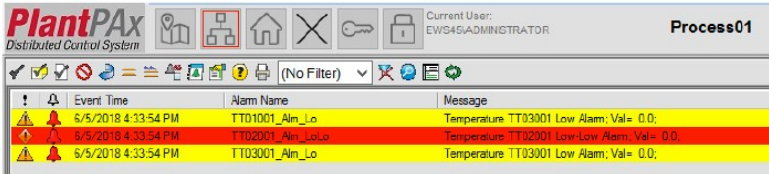
- For both single monitor and four-monitor configurations, Level 2 and Level 3 displays contain a header, Level 2 button bar, and Level 3 button bar for navigation.

2.1.5 Alarm Summary

The alarm summary displays alarms for the selected Process Area. If users change the Process Area using the Display Navigation Map, the alarm summary will update to show relevant alarms.



Below is an example of alarms in the Alarm Summary.



At the bottom of the alarm summary are navigation buttons to additional alarm screens.



- For single-monitor configuration, the Alarm Summary is accessed using the bell icon button in the header
- For four-monitor configuration, the alarm summary is continuously displayed on monitor 2

3 HMI Instance Configuration

Each HMI instance should have its own client file. A client file defines the characteristics of how the client runs including startup displays, macros that will run at startup, whether a Windows title bar is displayed, and other configuration properties. Each instance of the HMI template deployed in a distributed system operates independently of all other template deployments.

3.1 Standard System Functionality

The design of the template provides the operator with an effective and efficient interface to control and monitor the process facility or area. Alarm grouping and naming, which facilitates effective communication of alarms in a logical manner, is described later in this document. Navigation objects are included that provide the yoking functionality that minimizes the number of clicks to perform operations and simplifies the navigation workflow for operators.

4 Operator Interaction Methodologies

When designing an HMI, it is important to consider the method in which users interact with the application:

- Touch (touch tool such as touch pen, hand, gloved hand, etc.)
- Keyboard
- Mouse or trackball

The Library of Process Objects natively supports all of these interaction methods. Key factors to keep in mind are the interaction methods that affect the size of the hit zones. For example:

- Touch requires a larger hit zone and spacing between hit zones so there is not accidental activation of objects.
- For keyboard and mouse, hit zones can be smaller due to accuracy and size of the mouse pointer.

Refer to **Section 8.15 Input Controls** for more details about appropriate sizing.

5 Display Layout and Design Considerations

The information on HMI displays should:

- Meet the needs of the users
- Match users' understanding of operations and how the information is related
- Show only the necessary information for the task
- Allow users to quickly understand current and future status and system response to actions
- Reduce visual clutter

To meet these goals, first determine:

- Users' goals, tasks, and mental model
- Information and controls that are necessary for the task
- The most appropriate way of representing the information and controls
- Contextual information that is of value for each element of information
- How to group information
- How to highlight key information
- How to assist with situation awareness
- How to physically layout and align information

IMPORTANT: Displays should be designed for the primary (typically the operator) users while still supporting secondary users. The latter will still use the HMI, but the information they need can be provided on secondary displays or pop-up screens.

5.1 Users' Goals, Tasks, and Mental Model

Understanding the users' goals, tasks, workflow, and mental model is a critical first step in HMI design and should be completed by observing and interviewing users to document:

- Their job goals and related tasks
- Their understanding of how operations work
- How the information and controls of the operations are related
- Their understanding of their tasks

Prototyping new displays with users is another way to gather data on whether the displays meet users' goals, tasks, and mental model. The way users understand operations and their tasks does not always match the way the system is mechanically designed or how the system is laid out in a Piping and Instrument Diagram (P&ID).

A prototype does not need to be drawn with the HMI package that will be utilized, for instance a prototype can be drawn in any drawing package, although if there is already an HMI toolkit available containing the necessary objects that will be used then this would be the quickest way to generate a prototype.

5.2 Necessary Information and Controls

Determining what information and controls are necessary in an HMI requires understanding the users' goals, tasks, and perception of the tasks and operations. Information that is unnecessary clutters the screen and should be eliminated, leaving only information the user needs to successfully execute their job function. Keeping focus on the most critical information can be accomplished using methods such as sizing and placement on display.

HMI displays contain data pixels and non-data pixels. Non-data pixels are any pixels that are not used to display data, including static labels, icons, and lines. All pixels (non-data and data) consume users' attention and memory, so it's important that every pixel has a purpose. Some non-data pixels provide understanding and context and cannot be removed without causing loss of meaning and clarity to the display. These should be visually muted so they do their job without attracting attention.

5.3 Data Presentation

There are different ways to present data on an HMI display. The choice of format is dependent on the type of information, intended message, and users' needs. Only information that is meaningful for the task the user is performing should be presented. It is critical to consistently display the same type of information on the same display, across displays, and throughout the system.

5.4 Contextual Information

For each element on the display, determine what contextual information would help turn that data into useful information. For example, a bar graph can show more than just current state; it

can also indicate high point, low point, alarm points, and set points. This provides context to the users of whether that element is in a good state, bad state, or moving towards a good or bad state. Contextual information can also be provided by placing different data elements next to each other. For example, placing multiple, related bar graphs next to each other inside a tank vessel or showing a trend next to a bar graph provides additional context for that data.

5.5 Grouping

Grouping related information provides additional context, visual cues, and value. For example, when placing several bar graphs of related information next to each other, they should be scaled appropriately so users can easily determine that everything is good if they see a straight line. If that line is not straight, users should be able to identify that there is an issue without having to look for more information or wait for an alarm.

Encourage meaningful comparisons by doing the following:

- Combining items in a single table or graph
- Placing items close to one another
- Linking items in different groups using a common color
- Including comparative values for clarity (i.e. ratios, percentages, or variances)

Grouping can be done by spatially placing related items near each other, using lines, or using background shading. The goal is to reduce visual clutter using the least visible means. Not all information must be compared or linked to everything else. Discourage meaningless comparisons by separating items from one another spatially.

5.6 Highlighting Key Information

Key information and controls should have more prominence than the less important information. This includes information that is always important or information that is only important at the moment. This keeps users from being distracted by less important information.

Highlighting should be done by placement, size, enclosure, and shading/coloring.

- Placement: Top-left region of display is area of greatest emphasis, all else being equal
- Size: Larger items receive more emphasis
- Enclosure: Anything enclosed by borders or surrounded by a fill color can stand out

Keep highlighting to a minimum since displays should only show necessary information and be organized to match the users' mental model and task workflow.

5.7 Situation Awareness

Users need to be aware of the current and future status of the operations and task. While performing a task, it is easy to lose this awareness. The layout of the display should be designed to help users quickly recognize the status of operations, status of the task, and where the operations and task is heading.

Using alarm state icons is helpful for situational awareness. Placing these icons on items that are in alarm and providing a list of the highest priority alarms occurring helps users quickly assess the current situation. Using specific colors to indicate alarms (and not using those colors elsewhere) allows the alarms to stand out against the rest of the information on the screen.

Trends can also give an indication of what the process has been doing and where it may be heading. For example, a temperature may be in the normal range, but if it has been steadily rising

over a period of time, it may eventually rise beyond the high limit. A trend display can quickly show this increase over time while a bar graph or numeric display cannot.

5.8 Physical Layout and Alignment

After determining what information needs to be on the display, the designer needs to determine how to physically locate each piece of information on the screen. As previously mentioned, related information should be grouped and key information highlighted. Additionally, if the information is part of the users' mental model (important for accomplishing the task), it may be laid out to match operations. For example, a pump that is vertically higher than a tank can have its information appear higher than the tank on the display. This may be important so users are aware of the physical relation between the two components. Make sure this is necessary information so it does not create visual clutter and restrict the layout of the display.

Basic alignment guidelines:

- Labels for data are to be left justified, with the data to the right or underneath the label
- Numeric data that is related and meant to be compared are to be justified alike, with the decimal points aligning. Usually this means data needs to be right justified
- If the entire display contains unrelated data, then the data is to be left justified
- Engineering units appearing to the right of the numeric values shall be left justified
- Data is not to be center justified unless it appears in a button, table or diagram where center justification is needed
- Align to a grid with attention paid to margins, spacing, and padding

Items on a display should be spaced far enough apart from each other so they do not overlap and are visibly distinct objects, but not spaced so far apart that there is unnecessary unused space on the display. Objects close together are subconsciously grouped together, so place related objects close to each other and unrelated objects farther apart to ensure users perceive the correct relationship of data on a display.

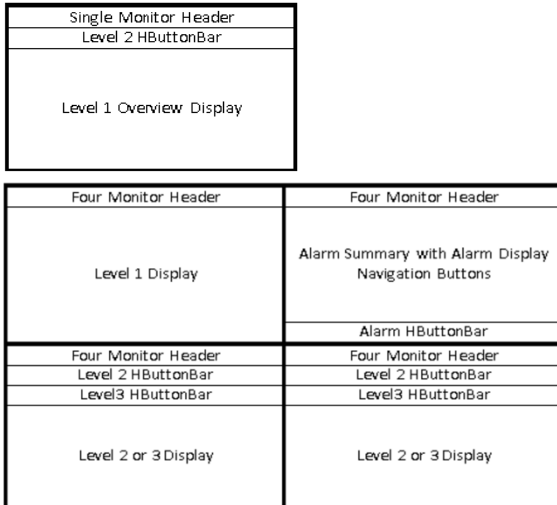
Minimum spacing is 4 pixels to ensure there is no overlapping. For touch interface, spacing is 10 pixels between command touch objects to prevent accidental activation. For navigation touch objects, there should be no additional padding between objects.

6 Navigation Methods

There should be multiple methods of navigation to move through the display hierarchy including main navigation on every display and additional navigation buttons to related displays, such as at the top or bottom of screen or end of a process line. Users should be able to easily navigate without being familiar with the hierarchy. This is particularly useful for maintenance and engineering.

Consideration should also be given to navigation within displays such as tabs or paging. Navigational elements should appear in consistent locations and use consistent buttons, icons, and/or text across faceplates.

The PlantPAx HMI template provides several different forms of navigation, as shown in the following template.



Navigation is available from the header, navigation bar, and display itself. In the top header, there is a button to the Display Navigation Map as shown below. This allows users to switch between process areas.



Each process area contains an overview display, Level 2 displays, and Level 3 displays. For the single-monitor setup:

- Users navigate to the Level 2 and 3 displays from the overview display
- The top header also contains links to the Alarm Summary

For the four-monitor setup:

- Screens 3 and 4 are dedicated to Level 2 and 3 displays
- Select a process area to invoke a screen update to show information from that process area on all four monitors

On the Level 2 navigation bar, there are buttons that link to the Level 2 displays. This navigation appears on Level 2 and Level 3 displays. For the single-monitor setup, this also appears on Level 1 displays.



On the Level 3 Navigation Bar, there are buttons that link to level 3 displays. This navigation appears on Level 2 and Level 3 displays. Faceplates also have navigation as part of the faceplate object. Refer to Section 8.16 Faceplates and Popups for more details.







7 Design Application Standards



This section contains application standards that are used in the Library of Process Objects and should be used to ensure consistency and effectiveness in the HMI design.

Refer to publication PROCES-RM002 (Rockwell Automation Library of Process Objects: Configuration and Usage) and publication PROCES-RM014 (Rockwell Automation Library of Process Objects: Display Elements) for additional details not included in this document.

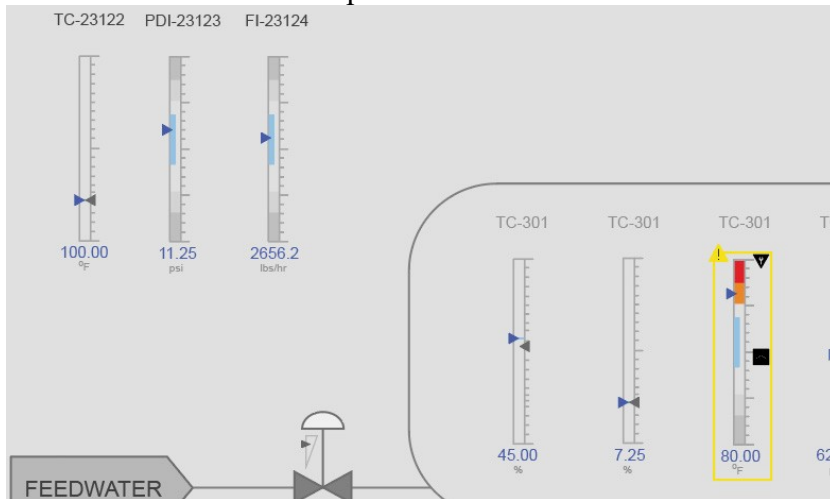
7.1 Color Conventions

The following color conventions shall be used in developing Wastewater Scada HMI and OIT graphic screens.

Notification Color Use	Alarms/Severity	Color Name	Definition
Low Priority Alarm	Input Failure=1, No Motors to Stop=100, I/O Fault=200, Analog Rate of Change=250,	Magenta	 R145 G106 B173 #916AAD Range 1-250
Low Priority Alarm Foreground		White	 R255 G255 B255 #FFFFFF
Medium Priority Alarm	(Analog) Low=350, (Analog) Low-Low=450, Interlocks=500	Yellow	 R245 G225 B027 #F5E11B Range 251-500
Medium Priority Alarm Foreground		Dark Gray 63	 R063 G063 B063 #3F3F3F
High Priority Alarm	(Analog) High=700, (Digital, if two Floats present) High=700. Transit Stall=700, Fail to Stop=725, Fail to Start=750, Trip Fault=750, Actuator Fault=750,	Orange	 R236 G134 B041 #EC8629 Range 501-750
High Priority Alarm Foreground		White	 R255 G255 B255 #FFFFFF































Urgent Priority Alarm	No Motors to Start=800, Full Stall=850, (Analog) High High=1000, (Digital, for only one Float present) High High=1000, Comm Failure=1000,	Red	 R226 G032 B040 #E22028 Range 751-1000
Urgent Priority Alarm Foreground		White	 R255 G255 B255 #FFFFFF

























Below is an example image of appropriate use of color. Color is reserved for live data and alarms, with the alarms having more noticeable colors. All other objects use shades of gray so as not to distract from more important information.



Example Appropriate Use of Color for Data

Below are the colors used in the PlantPax library. Follow these colors when creating your own HMI elements to ensure consistency in the HMI.

Display Color Use	Color Name	Definition
Display Background (no tabs)	Light Gray 224	 R224 G224 B224 #E0E0E0
Tab Panel Background	Light Gray 224	 R224 G224 B224 #E0E0E0
Display Background behind tabs (with tabs)	Silver 192	 R192 G192 B192 #C0C0C0
Static Object Color Use	Color Name	Definition
Title Foreground	Dark Gray 63	 R063 G063 B063 #3F3F3F
Group Heading Foreground	Dark Gray 63	 R063 G063 B063 #3F3F3F
Column Heading Foreground	Dark Gray 63	 R063 G063 B063 #3F3F3F
Separator Line Color	Light Gray 216	 R216 G216 B216 #D8D8D8
Process and Connector lines	Gray 160	 R160 G160 B164 #A0A0A4
Equipment Border	Gray 160	 R160 G160 B164 #A0A0A4
Grouping Box	Light Gray 232	 R232 G232 B232 #E8E8E8
Notification Color Use	Color Name	Definition
Low Priority Alarm	Magenta	 R145 G106 B173 #916AAD
Low Priority Alarm Foreground	White	 R255 G255 B255 #FFFFFF
Medium Priority Alarm	Yellow	 R245 G225 B027 #F5E11B
Medium Priority Alarm Foreground	Dark Gray 63	 R063 G063 B063 #3F3F3F
High Priority Alarm	Orange	 R236 G134 B041 #EC8629
High Priority Alarm Foreground	White	 R255 G255 B255 #FFFFFF
Urgent Priority Alarm	Red	 R226 G032 B040 #E22028
Urgent Priority Alarm Foreground	White	 R255 G255 B255 #FFFFFF
Program Error/Bad Configuration	Black	 R000 G000 B000 #000000
Program Error/Bad Configuration Foreground	White	 R255 G255 B255 #FFFFFF
Fault Condition Background	Black	 R000 G000 B000 #000000
Fault Condition Foreground	White	 R255 G255 B255 #FFFFFF
Warning Condition Background	Dark Gray 63	 R063 G063 B063 #3F3F3F
Warning Condition Foreground	White	 R255 G255 B255 #FFFFFF
Prompts and Attention Background	Light Gray 224	 R224 G224 B224 #E0E0E0
Prompts and Attention Foreground	Black	 R000 G000 B000 #000000
Testing or Simulation Background	Light Gray 224	 R224 G224 B224 #E0E0E0
Testing or Simulation Foreground	Black	 R000 G000 B000 #000000
Other Abnormal State Background	Light Gray 224	 R224 G224 B224 #E0E0E0
Other Abnormal State Foreground	Black	 R000 G000 B000 #000000

If the normal state can appear in a control showing a notification, then the colors used for the normal state shall follow either State or Dynamic Data color uses standards		
Element State Color	Color Name	Definition
Off/De-energized/Idle/Stopped/Closed		
Off/De-energized/Idle/Stopped/Closed	Gray	 R128 G128 B128 #808080
On/Energized/Running/Open	Off White	 R240 G240 B240 #F0F0F0
Disabled/Out of Service	Gray	 R128 G128 B128 #808080
Manual Operations (Jogging)	Light Blue	 R147 G194 B228 #93C2E4
Transition (Starting, Stopping, Accelerating, Decelerating, Opening, Closing)	Light Blue	 R147 G194 B228 #93C2E4
Data Entry Color	Color Name	Definition
Label Foreground	Dark Gray 63	 R063 G063 B063 #3F3F3F
Engineering Unit Foreground	Light Gray 91	 R145 G145 B145 #919191
Input Field Foreground (edits allowed)	Dark Gray 63	 R063 G063 B063 #3F3F3F
Checkbox Foreground (edits allowed)	Dark Gray 63	 R063 G063 B063 #3F3F3F
Radio Button Foreground (edits allowed)	Dark Gray 63	 R063 G063 B063 #3F3F3F
Input Field Foreground (edits prohibited)	Gray	 R192 G192 B192 #C0C0C0
Checkbox Foreground (edits prohibited)	Gray	 R192 G192 B192 #C0C0C0
Radio Button Foreground (edits prohibited)	Gray	 R192 G192 B192 #C0C0C0
Input Field, Checkbox, Radio Button Background (edits allowed)	White	 R255 G255 B255 #FFFFFF
Input Field, Checkbox, Radio Button Background (edits prohibited)	Light Gray	 R224 G224 B224 #E0E0E0
Dynamic Data Display Color	Color Name	Definition
Label Foreground	Dark Gray 63	 R063 G063 B063 #3F3F3F
Engineering Unit Foreground	Light Gray 91	 R145 G145 B145 #919191
Data Foreground	Blue	 R071 G092 B167 #475CA7
Data Border (for diagrams only)	Light Gray	 R192 G192 B192 #C0C0C0
Primary State Indicator Foreground	Blue	 R071 G092 B167 #475CA7
Primary State Indicator Background	Light Gray	 R212 G212 B212 #D4D4D4
Navigation Button	Color Name	Definition
Foreground (Fill)	Light Gray 198	 R198 G198 B198 #C6C6C6
Border (Outline)	Gray 170	 R170 G170 B170 #AAAAAA
Label	Dark Gray 63	 R063 G063 B063 #3F3F3F

Piping Graphics

Process pipes will be represented by the 2D graphic “Line” Line width “2”

Element State Color	Color Name	Definition
2D Graphic Line	Black	■ R000 G000 B000 #000000

Structure Graphics

Structures will be represented by the 2D graphic “Line” Line width “1”

Element State Color	Color Name	Definition
Structure Lines	Dark Gray 63	■ R063 G063 B063 #3F3F3F

Common Standards HMI and OIT

Text Fonts and Colors

Static text for Equipment status if not part of a Faceplate labeling will be Arial 8 font,

Text Color Equipment Status	Light Gray 91	■ R150 G150 B150 #919191
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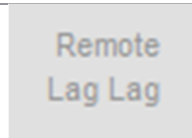


Figure 7 - Static Text for Equipment Status Example

Static text for Naming locations or Areas will be Arial Bold 8 font,

Text Color Locations/Areas	Black	■ R000 G000 B000 #000000
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8 PanelView OIT Screen Design

The following section will describe the design parameters used for OIT development. The actual building blocks for the picture development can be found on the OIT system on the imported PlantPax Global Objects for PlantPax Library ver 4.1.

Note: To keep the OIT Application small use Direct Reference Tags and delete any unused Screens from the Application when completed. Panelviews have limited storage for Screens/Tags/Logging.

8.1 Screen Resolution

All PanelView nodes will use a screen resolution of 1024 x 768 15” or 1280 x 1024 for Wide Screen 19”

Level 1 PlantPax Overview no control. First Screen to be displayed when application is started. (Home Screen)

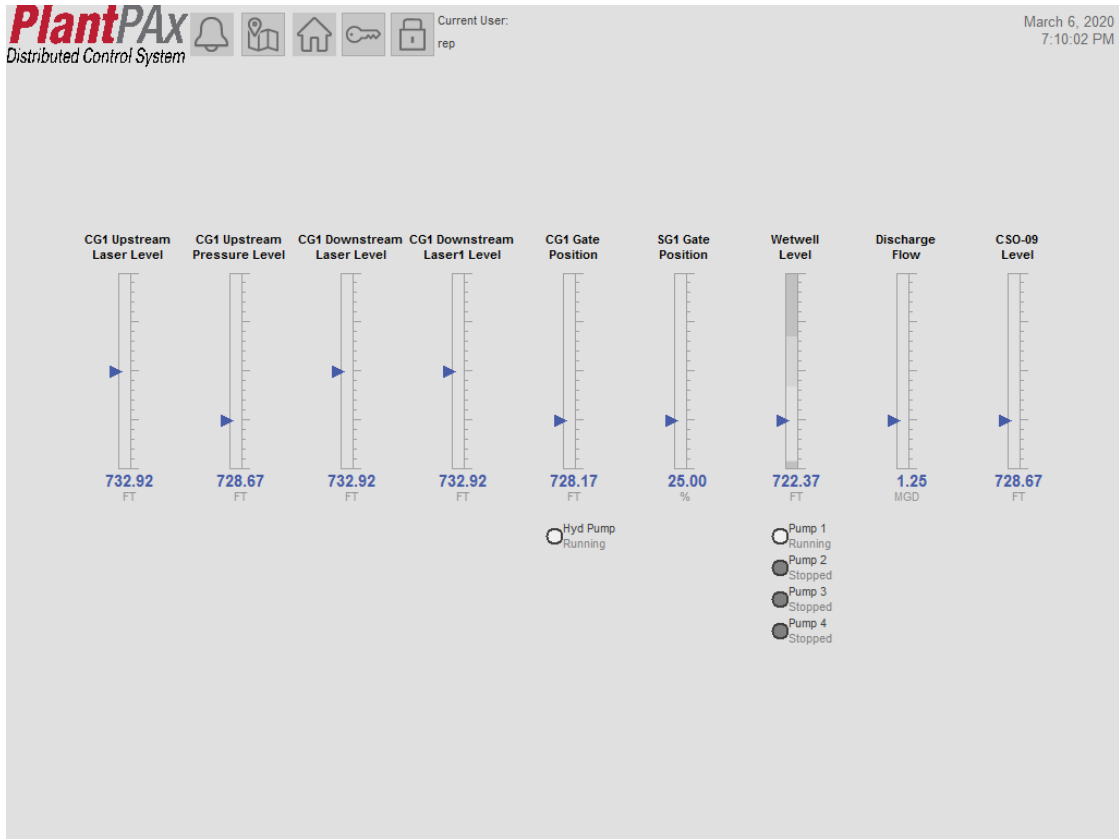


Figure 21 – Home Screen

Level 2, PlantPax-Operations Control Screen and overview of the station. This screen has the ability for controlling the process through Faceplates. Touch one of the pump graphics and a Faceplate will appear. This Faceplate allows you to control the pump in Auto (Program) mode or Manual (Operator) mode. If the pumps are tied to an Alternator as Gooseneck Pump Station is then all the Program and Operator control will be done

through the Alternator. The Pump Faceplates can still be opened for viewing Interlocks, Runtimes, Naming, etc.

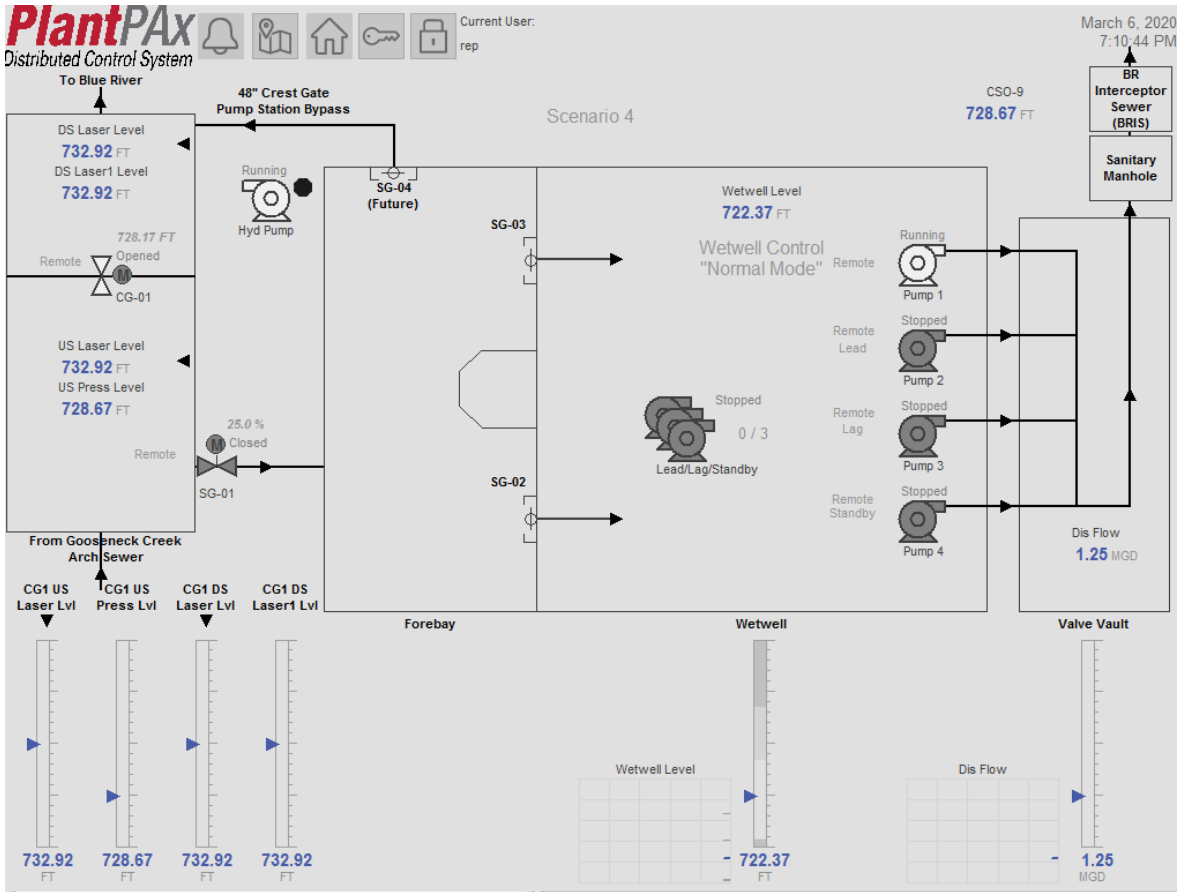







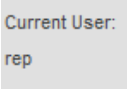
Figure 22 – Overview Screen

Title Bar for all screens, used for login in, opening the Display Navigation popup, navigate to the Alarm screen, shows who is logged in, and Date/Time.



1. "Alarm Navigation" Button  Opens the Alarm Screen.
2. "Display Navigation" Button  Opens a popup screen that has more Navigation buttons.
3. "Home Navigation" Button  Opens the Home Screen or Overview Screen.
4. "Log In" Button  Used to "Login" for accessing different levels of the process.
 - a. Initial Login "User Name" will be, "admin"
 - b. Initial Login "Password" will be, "Station Number"

Note: The Initial Login will be removed when a Network connection is made to a SCADA FTView SE system. The Login will then be from a Domain Controller Server "DC" using the Active Directory.

5. "Log Out" Button  Used to "Log Out" the current user and automatically Logs in a "Default" user with "View Only" credentials.
6. Current user  shows what user is currently logged in.

Maintenance Screen for pulling up PDF Files/extras.

PLC Drawings

Logix with Data from L_CPU

Line Creek
Remote Run

Objects that use data from RSLinx Diagnostic tags, L_CPU AOI, and UDT L_CPU_Out to display controller information

L_TaskMon		L_TaskMon Summary	
Task_C_250ms	Task_D_500ms		
3000.00	3000.00		
0.99	9.81		
1.13	10.03		
7	8		
250.00	500.00		

Login to
Shutdown
Panelview

Figure 23 – Maintenance Screen

Setpoint Screen, there will be some controls that cannot be accomplished by PlantPax programming. These programs are added to the PlantPax programming in the PLC requiring Operator entered Setpoints to maintain the control process.

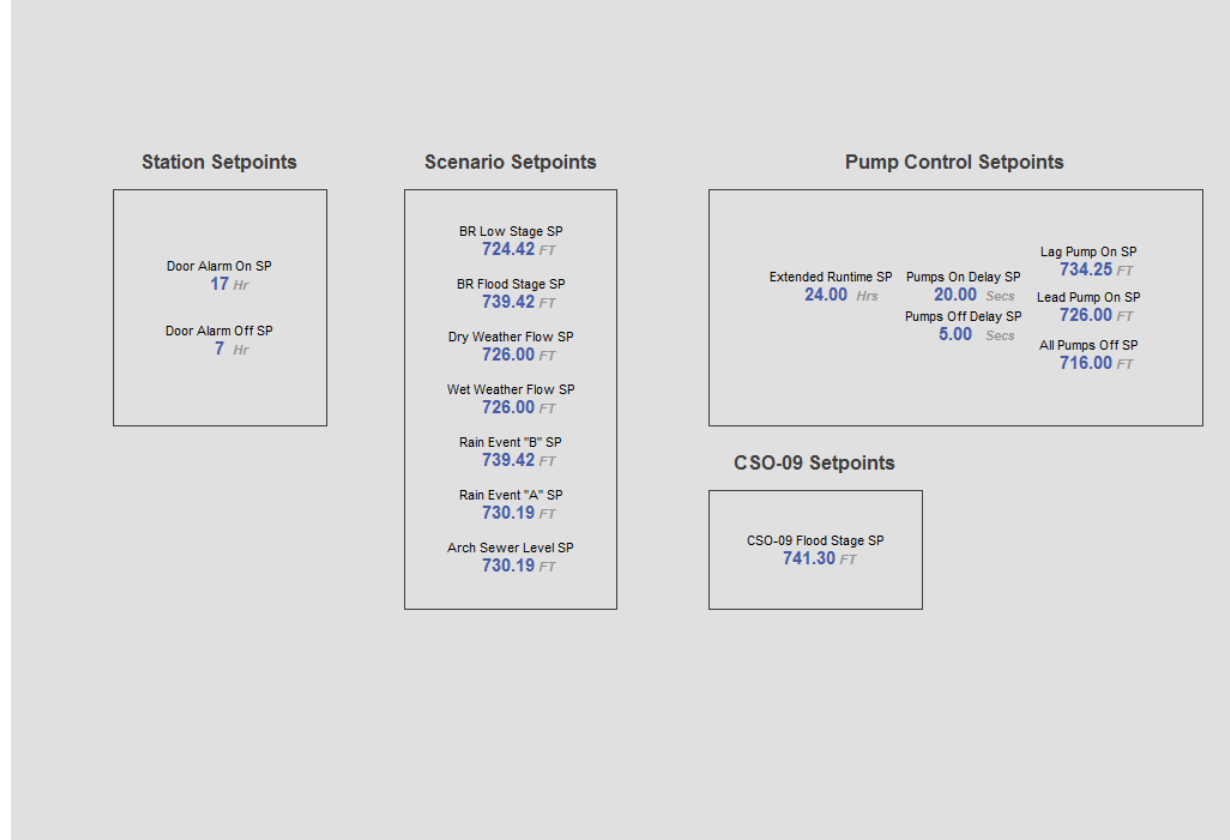


Figure 25 – Setpoints

- Alarm Screen, The Alarm Screen is split into two sections,
1. Unacknowledged, Active and Inactive alarms that have not been acknowledged.
 2. Acknowledged, Active and Inactive alarms that have been acknowledged.

When there is an Active alarm it is represented by the letter “A” on the left hand side of the Alarm Summary screen

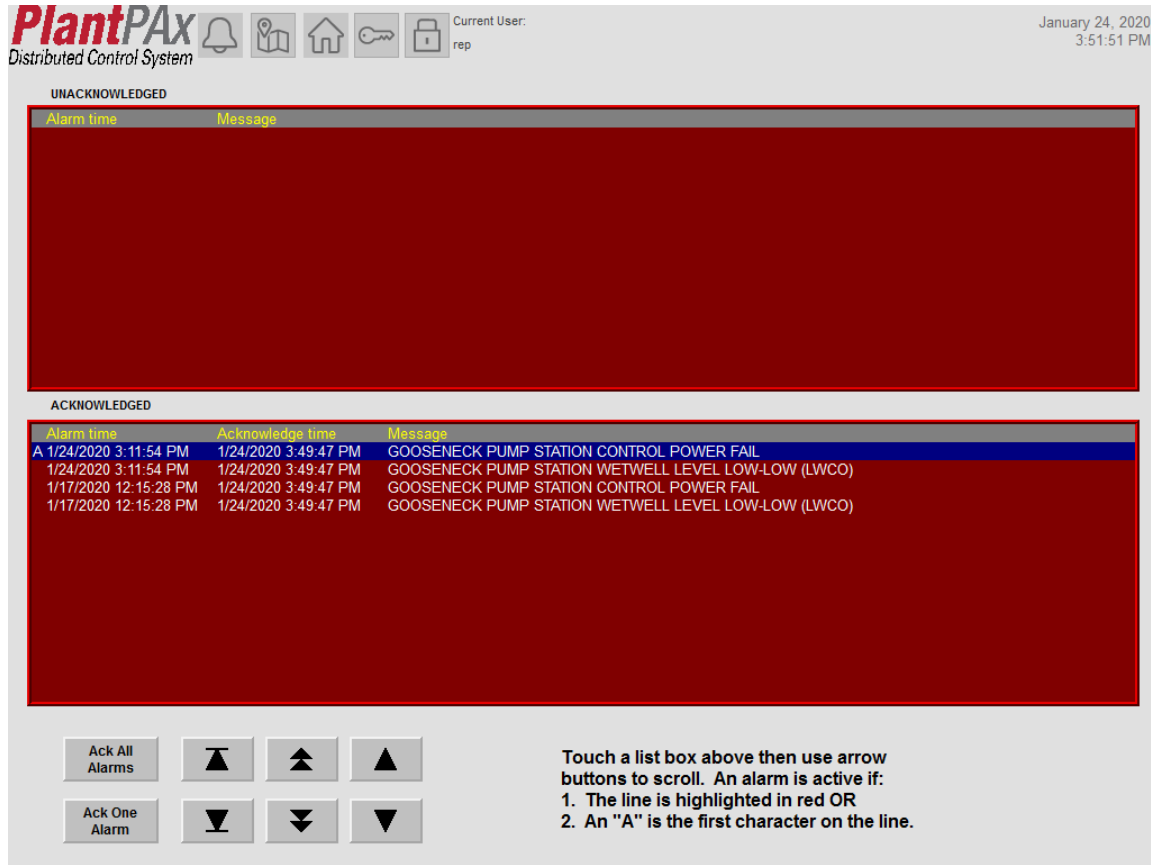


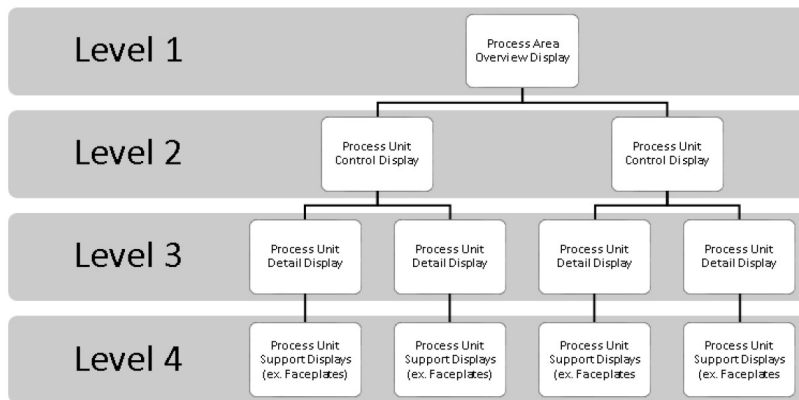
Figure 26 – Alarm Screen

9 Panelview OIT Display Levels

Understanding the users’ goals, tasks, and mental model is crucial to determining the organization of the displays in an OIT project. They should be organized for the primary user as

identified in user research. In most cases this is the operator. Secondary users need to be considered as well, but the information they need can be provided on separate displays or workstations.

The hierarchy and organization of the displays should be created to provide progressive disclosure of information. A clean, simple display with an overview of the operations should lead to other displays that contain more complexity and detail as users navigate deeper into the hierarchy. Using this methodology provides a quick look and allows the user to initiate the action of diving deeper for more information rather than having it clutter the initial display. There are four levels that are recommended for the display hierarchy, each level providing more detail than the previous level.



Level 1: Overview Display

Provides an overview of the operator's entire span of responsibility.

Level 2: Process Unit Control Display

Operator's primary operating display. Used during normal operations, routine changes, and monitoring.

Level 3: Process Unit Detail Display

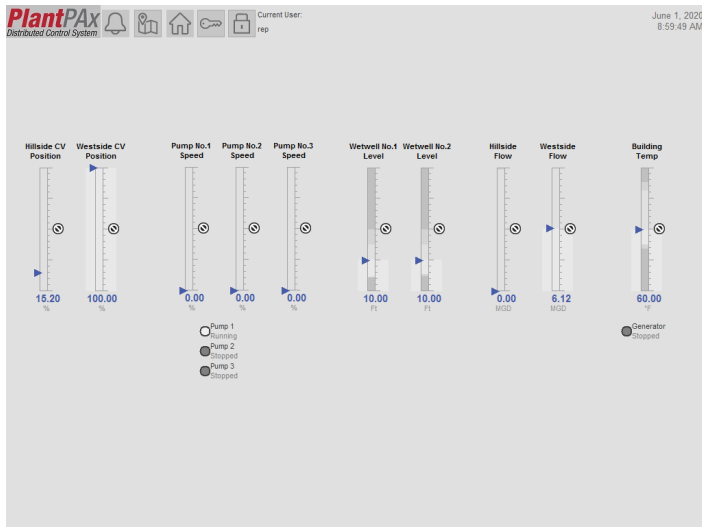
Non-routine operations. Provides sufficient information to facilitate process diagnostics.

Level 4: Process Unit Support Display

Interlocks, Diagnostics, Help, and Documentation; delivered on faceplates or popup displays.

9.1 Level 1 Displays: Process Overview

Level 1 displays contain high-level overview information that can be assimilated quickly, provide clear indication of current performance, and highlight anything that requires immediate attention. Control should not be performed from this display.



Example Level 1 display

Level 1 displays contain the following types of elements:

- High-level Key Performance Indicators (KPI)
- Alarms of top 2 or 3 highest priorities
- Important calculated parameters and conditions
- Important information from upstream and downstream units
- Advanced control mechanisms performance and status
- Major equipment status
- Appropriate trends of important parameters
- Indications of abnormal situations, denoting severity

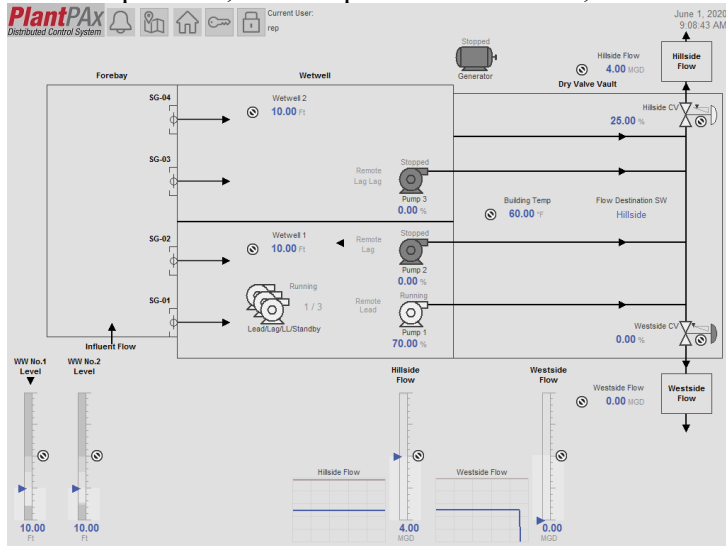
There should only be one overview display for a specific operating position; however, there may be different ones for different modes or process changes such as batch.

Level 1 displays are crucial as they provide contextual information; however, they may not contain all information users need to perform their jobs. Instead, they provide current state of operations, indications of abnormal situations that may be occurring, and quick and easy access to additional information.

Level 1 displays should be designed secondarily to Level 2 displays.

9.2 Level 2 Displays: Process Unit Operating Graphics

Level 2 displays are the primary displays used for operators to perform their tasks and should be designed first. Level 2 displays should match the users' mental model of the machine and operation and provide easy access to related displays in the display hierarchy. There may be multiple Level 2 displays for the same equipment to cover specific situations such as startup, normal operation, state or product transitions, and shutdown.



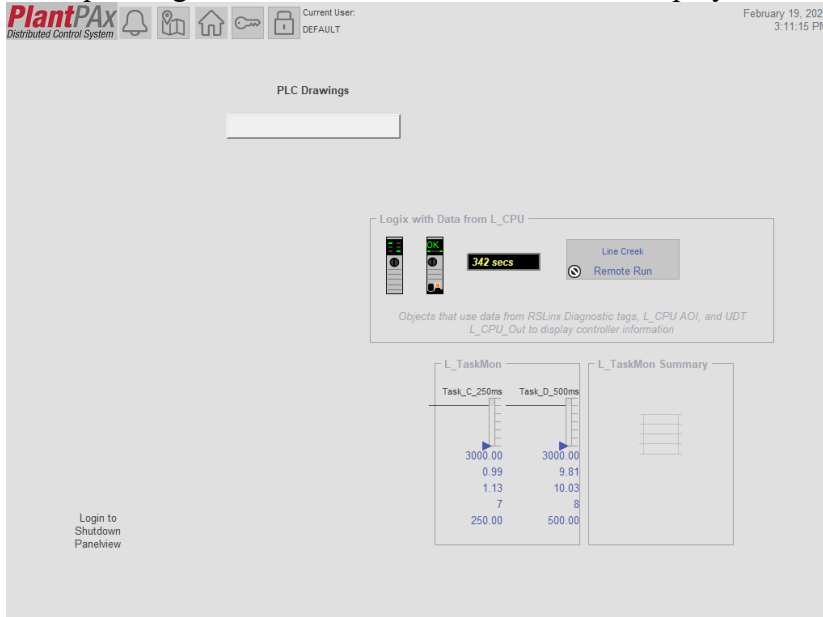
Example Level 2 display

Level 2 displays contain the following types of elements that are relevant to the tasks to be accomplished by that display:

- Key Performance Indicators (KPI)
- Controls needed to accomplish tasks (or access to controls, such as easy access to faceplates that contain controls)
- Indicators needed to accomplish tasks
- Navigation to related displays
- Navigation to overview display
- Indications of abnormal situations, denoting severity

9.3 Level 3 Displays: Process Detail Displays

Level 3 displays contain much more detail and controls. They contain detailed view of sub-units, individual equipment items, components, and their related controls and indications. They are used for detailed investigations and interventions and are intended primarily for troubleshooting or manipulating items not accessible from Level 2 displays.



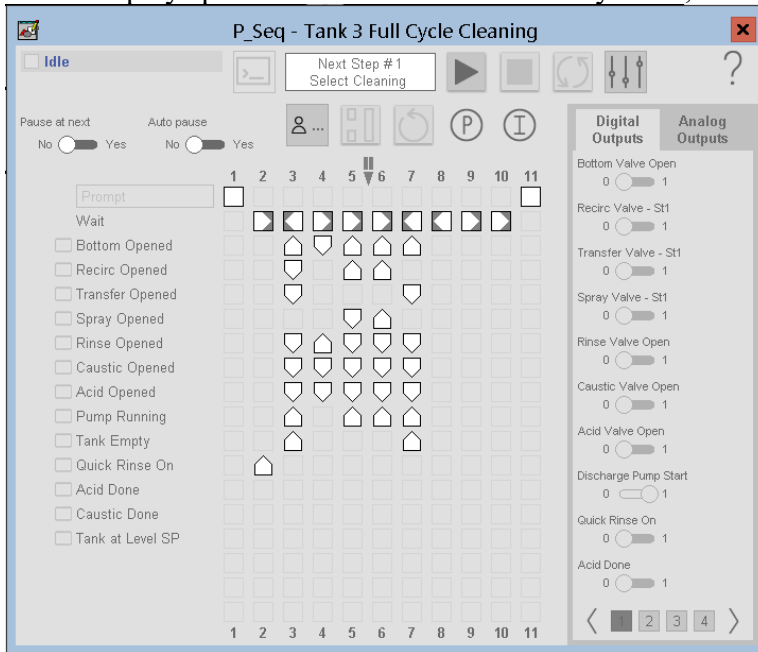
Example Level 3 display

Level 3 displays contain the following types of elements that are relevant to the tasks to be accomplished by that display:

- Alarms of all priorities relevant to that display
- Controls
- Indicators
- Detail view of equipment

9.4 Level 4 Displays: Process Support and Diagnostics Displays

Level 4 displays provide the most detail of subsystems, individual sensors, or components.



Example Level 4 display

Examples include:














- Alarm displays with details of individual sensor status
- Detailed info about equipment and instrumentation
- Detailed status of Advanced Process Control functionality
- System-supplied displays such as point detail, system diagnostics, alarm summary, etc.
- Help displays
- Operating procedures
- Alarm documentation and response guidance

Animated Graphics

Animated, or moving, graphics will not be used. Animated graphics generally do not provide meaningful information to an operator. Do not use spinning pumps, spinning mixers, bubbles, etc. All graphics will use color changes, as well as visibility on status words, to indicate status especially for the people that may not be able to perceive color changes.


General Color Conventions

The colors referenced in this document are based on those available with PlantPax software. Each main color is identified by a name and/or number designation based on the “System Default” color palette. Color and font selections should be consistent throughout all screens and pop-ups.

Display Background (no tabs)	Light Gray 224	 R224 G224 B224 #E0E0E0
Notification Color Use	Color Name	Definition
Low Priority Alarm	Magenta	 R145 G106 B173 #916AAD
Low Priority Alarm Foreground	White	 R255 G255 B255 #FFFFFF
Medium Priority Alarm	Yellow	 R245 G225 B027 #F5E11B
Medium Priority Alarm Foreground	Dark Gray 63	 R063 G063 B063 #3F3F3F
High Priority Alarm	Orange	 R236 G134 B041 #EC8629
High Priority Alarm Foreground	White	 R255 G255 B255 #FFFFFF
Urgent Priority Alarm	Red	 R226 G032 B040 #E22028
Element State Color	Color Name	Definition
Off/De-energized/Idle/Stopped/Closed	Gray	 R128 G128 B128#808080
On/Energized/Running/Open	Off White	 R240 G240 B240 #F0F0F0
Disabled/Out of Service	Gray	 R128 G128 B128 #808080
Manual Operations (Jogging)	Light Blue	 R147 G194 B228 #93C2E4
Transition (Starting, Stopping, Accelerating, Decelerating, Opening, Closing)	Light Blue	 R147 G194 B228 #93C2E4


Piping Graphics

Process pipes will be represented by the 2D graphic “Line” Line width “2”

Element State Color	Color Name	Definition
2D Graphic Line	Black	 R000 G000 B000 #000000

Structure Graphics


Structures will be represented by the 2D graphic “Line” Line width “1”

Element State Color	Color Name	Definition
Structure Lines	Dark Gray 63	 R063 G063 B063 #3F3F3F

Common Standards HMI and OIT

Text Fonts and Colors

Static text for Equipment status if not part of a Faceplate labeling will be Arial 8 font,

Text Color Equipment Status	Light Gray 91	 R150 G150 B150 #919191
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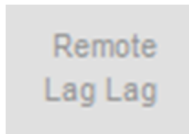


Figure 7 - Static Text for Equipment Status Example

Static text for Naming locations or Areas will be Arial Bold 8 font,

Text Color Locations/Areas	Black	 R000 G000 B000 #000000
----------------------------	-------	--



Figure 8 - Static Text for Naming Locations or Areas Example

Navigation

Along with the Tool Bar, navigating from screen to screen can be done through process links on the HMI. As for the OIT a “Display Map” Screen will be used. These process links will provide the navigation from screen to screen where process is linked by piping. Provide a navigation link on both the current and the destination screen so that the user can easily navigate back and forth through screens on the same process.

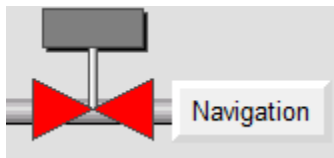


Figure 27 - Screen to Screen Navigation Example

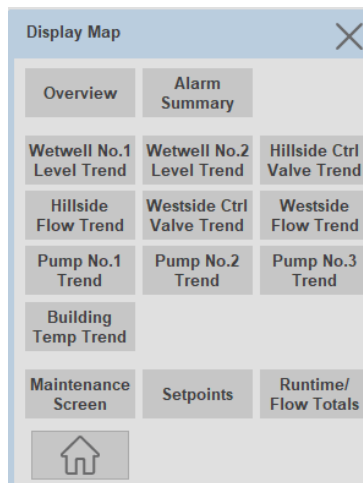


Figure 28 - Display Map Navigation Example

Analog Value Displays

Analog values, such as level and flow, are read from a field transmitter by a PLC. The Scaling will happen in the PLC per P_AIn AOI which will be setup from the Faceplate in either the HMI or OIT. Then the HMI will display the scaled value through a Global P_AIn object on a graphic screen. All analog values should be displayed in a similar manner. Show the Global Object on

the piping as required representing process flow through the system. Use (RA-BAS-ME) P_AIn Graphics Library.ggfx and (RA-FRAME-ME) P_AIn Graphics Library.ggfx Global Objects as the standard.

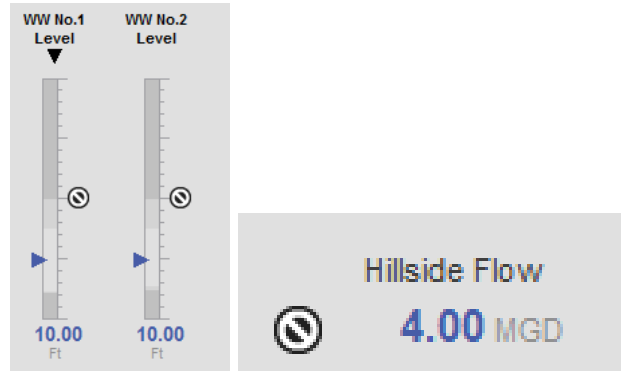


Figure 29 - Analog Value Display

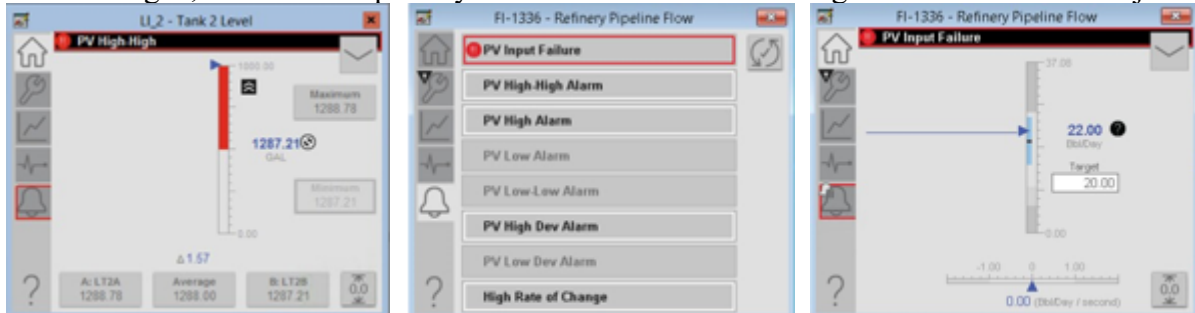
Analog Value Alarms

Analog values that need alarm setpoints will be programmed into the PLC respective AOI through the Faceplate.

Alarm Tab in Faceplate

The Alarm Tab displays the highest priority alarm. An urgent alarm is shown in the example below, resulting in a red border around the alarm tab. The tab also displays alarm state; for example, if users shelve an alarm, this is indicated on the alarm tab.

The alarm page in a faceplate lists all alarms. If an alarm is occurring, the display alarm icon and border become alarm color. If the alarm goes unacknowledged, then the border blinks. If acknowledged, the border is priority color. Users can acknowledge all alarms for this object.



Users can click on alarm from here to view more details and actions as seen below.

Figure 30 - Analog Setpoint Display

Analog Units

Flow can be in ###.# gpm

Or Flow in ##.# mgd

Flow totals in #,###,###.# gallons (resets to 0 after 9,999,999)

Flow totals in #,###,###.# gal x 1000 (resets to 0 after 9,999,999)






Flow totals in #,###,###.# mg (resets to 0 after 9,999,999)

Levels shown in feet from the floor ##.# ft
 Pressure in ##.# psi
 Speed in ###.# %
 Position in ###.# %
 Runtime in ###,###.# hrs (resets to 0 after 999,999.9)
 Airflow #####.# scfm
 MLSS ##.## mg/L
 Sludge Density ###.## mg/L

Valves

All valves will be displayed with the same icon, regardless of actual likeness. Orientation of Valves will determine placement in processes.

Dynamic Valve objects use the following color scheme:

Element State Color	Color Name	Definition
Closed	Gray	 R128 G128 B128 #808080
Open	Off White	 R240 G240 B240 #F0F0F0
Stopped	Light Blue	 R147 G194 B228 #93C2E4
Closing/Opening	Part Off White	 R240 G240 B240 #F0F0F0
	Part Gray	 R128 G128 B128 #808080

Variable position valve and open/close valves will look similar except the variable position valve will have an analog display that shows open position percentage. Global Object P_ValveC. Use (RA-BAS-ME) Process Graphics Library.ggfx Global Objects as the standard.

If the valve is controllable from the Plant Control System, selecting the valve icon will open the valve Faceplate.

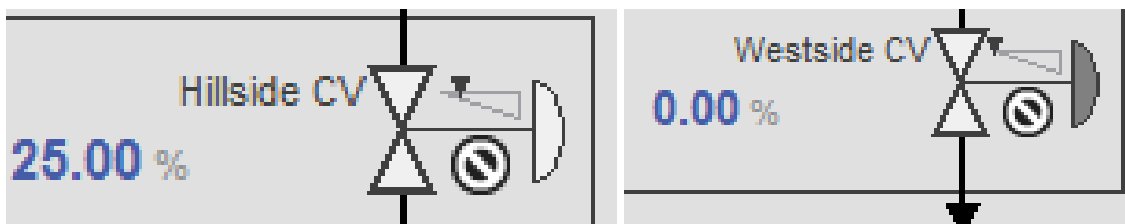


Figure 31- Typical Position Valve

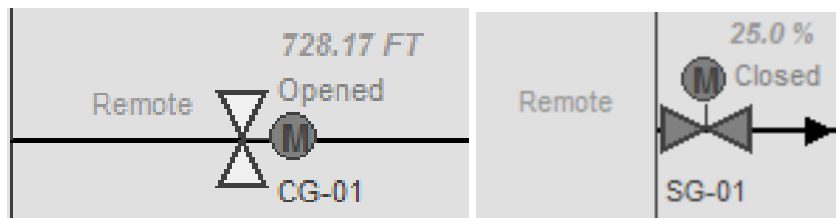







Figure 32 - Typical Open/Close Valve

Motors

All motors will be displayed with similar icons, regardless of actual likeness. Orientation of Motors will determine placement in processes.

Dynamic Motor objects use the following color scheme:

Element State Color	Color Name	Definition
Off/De-energized/Idle/Stopped	Gray	 R128 G128 B128 #808080
On/Energized/Running	Off White	 R240 G240 B240 #F0F0F0
Disabled/Out of Service	Gray	 R128 G128 B128 #808080
Manual Operations (Jogging)	Light Blue	 R147 G194 B228 #93C2E4
Transition: Starting, Stopping, Accelerating, Decelerating	Light Blue	 R147 G194 B228 #93C2E4

Variable speed motor and constant speed motors will look similar except the variable position motor will have an analog display near displaying speed position percentage. Use (RA-BAS-ME) P_VSD Graphics Library.ggfx and (RA-BAS-ME) P_MotorHO Graphics Library.ggfx and (RA-BAS-ME) P_Motor Graphics Library.ggfx Global Objects as the standard.

If the motor is controllable from the Plant Control System, selecting the motor icon will open the motor Faceplate.

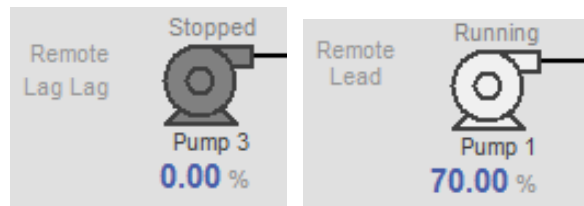


Figure 33 - Typical Variable Speed Motor (Pump)

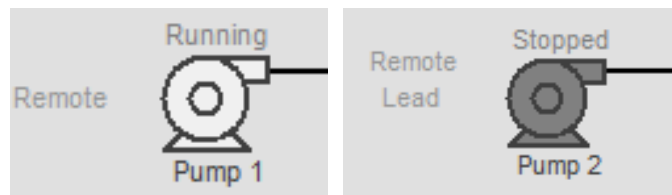


Figure 34 - Typical Constant Speed Motor (Mixer)

Operator Setpoint Entries

Operators will need to enter values into the plant control system if a Faceplate is not available. These setpoints could be for information, alarming, or control of equipment. All setpoint entries will be displayed on a Setpoint type screen. No setpoints will be able to be entered directly from the main screen area. Operator setpoint entries look similar to the analog value displays. Font will be Blue Arial Bold 11.

Data Foreground	Blue	 R071 G092 B167 #475CA7
-----------------	------	--

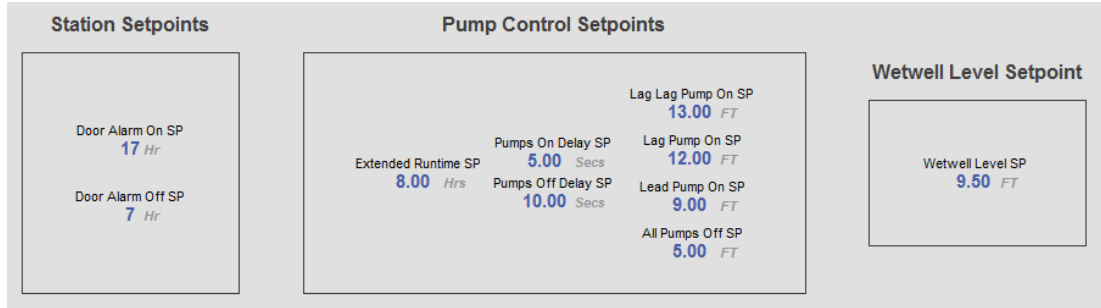


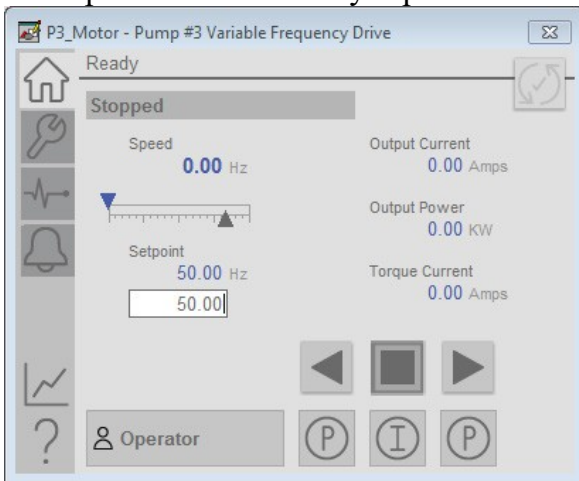
Figure 35 - Operator Setpoint Entries

Screen Control Faceplate

Faceplates are smaller “sub” screens that are called from a Global Object.

It is important to understand the users’ goals and tasks to determine what controls are needed.

Do not provide unnecessary capabilities— only what is necessary for achieving the tasks.



Example of controls on faceplate

Ensure consistency across controls.

- Similar controls are to use same method for entering commands or information
- Use consistent wording
- Use consistent location of entry area and information
- Use consistent location of interface management controls (e.g., scroll bar, navigation). Minimize the demands upon users.
- Do not require users to remember special codes or sequence or perform translations or conversions.
- Reduce what is required of the users and try to automate as much as possible. Beware when removing controls, as this can cause users to lose some aspects of situation awareness. This can be overcome by providing appropriate data and feedback.
- Ensure that the process of entering commands is logical.
- Support single method for input, as it is easier for users to stick with one method rather than jumping back and forth.

- Entry fields and controls need to be distinguishable from static text, so users do not have to hunt or question what is or is not a control.
- Consider providing default values where it makes sense.
- Do not require measurement of units to be entered.

Minimize potential errors.

- Allow ability to edit input before entering
- Important actions with significant consequence are to have confirmation mechanisms to avoid inadvertent activation
- Allow ability to have approval or confirmation

Level Indication

Tank levels shall be indicated by use of a Global Object P_AIn. This will assist an operator in determining the Level of a tank. The current level value shall be indicated along with proper Eng Units configured in the Faceplate. Use (RA-BAS-ME) P_AIn Graphics Library.ggfx and (RA-FRAME-ME) P_AIn Graphics Library.ggfx Global Objects as the standard.

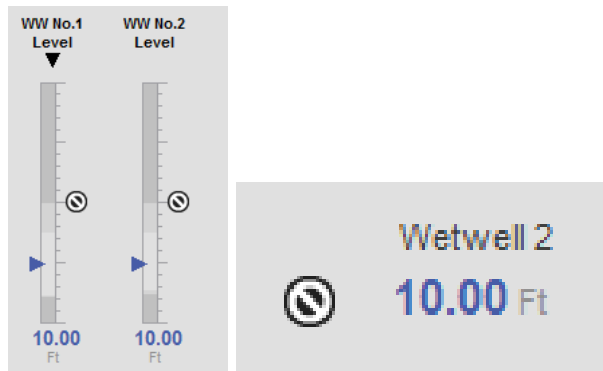


Figure 36 – Tank with Level Animation Example

Equipment Control

Control of the site processes will be programmed into the PLC's.

All controllable equipment that is programmed for manual operation, such as valves, pumps, etc., will have a Global Object with a Faceplate for operator control of available control, such as, Operator Off Program and speed adjustment. The Faceplate will open when an equipment symbol Global Object on the graphic display is selected. The Faceplate will be positioned so that the status information for the selected equipment will remain visible on the main screen, while the Faceplate is being used.

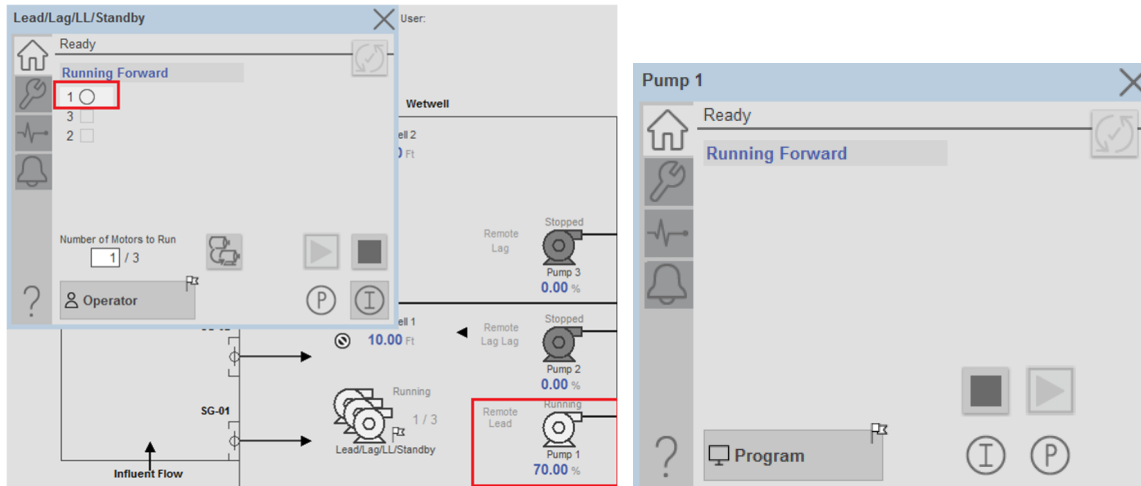


Figure 37 – Control Popup Location Example

Most systems will have multiple pumps that are controlled by an Alternator AOI (P_LLS). This Alternator Global Object will have control of pumps that are programmed in the PLC to be controlled by the Alternator. If this is the case then the Faceplate for each Pump does not have the ability to start and stop the pumps in Operator mode. You will have to use the Alternator Faceplate interface to start and stop pumps in Operator mode.

Data Retention File Backup Archive Standard

FTView SE Back Up

Using “FactoryTalk View SE Application Manager” for Distributed applications backup the Scada applications and save on the local hard drive and USB Flash Drive.

Also save the created Runtime Client on the local hard drive and USB Flash Drive.

Designate a Folder under the “C” drive as the Project folder (example: BlueRiver WWTP SCADA)

FTView ME Back Up

Use “Application Manager” for FTView ME applications backup the application and save on a USB Flash Drive.

Flash Drive Backup

Who:

Anyone changing a program

What:

All programs and configuration files need to be backed up. Back Up everything it would take to re-create the system.

When:

Save what you are working on every day to the ProjectFlashDrive. Sync it to the server at least weekly and when you’re finished working on it.

How:

Use Microsoft SyncToy to keep all folders updated. This can be downloaded at

<http://www.microsoft.com/en-us/download/confirmation.aspx?id=15155>

On the

ProjectFlashDrive maintain a folder for each location you are working on

G:\MO\Kansas

City\Wastewater_Project_Backup\Site\HMI

G:\MO\Kansas City\Wastewater_Project_Backup\Site\PLC

G:\MO\Kansas City\Wastewater_Project_Backup\Site\FILES

Set up a Folder Pair using the SyncToy Action Synchronize between the ProjectFlashDrive and the server. A common “_Project_Backup” folder structure is copied to each site location folder.

Backup copies of each file shall be designated with the file name and YEAR_MONTH_DAY.

Example: KCMO BlueRiver WWTP_2020_Jun_20.apa

Where:

Files shall be backed up on the Site Scada Server Eng Work Station, Project Flash Drive, and KCMO “ecads” folder on the KCMO Water Server.

Alarms/Events

Alarm/Events Tag Selection Spreadsheet example

Currently in the Alarm Data Base	Currently Historically Logged	Local Address	Tag Name	Description	Data Types	Alarm Logging "Yes"	Alarm Logging "No"	Historical Logging "Yes"	Historical Logging "No"
xxx	xxx	xxxxxx	xxxxxx	xxxxxxxxxxx	xxxxx	xxx	xxx	xxx	xxx
Yes	Yes		AT_121_1	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_2	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_3	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_4	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_5	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_6	H2S East Blue Pump Floor Concentration					
Yes	Yes		AT_121_7	H2S Round Grove Pump Floor Concentration					
Yes	Yes		AT_121_8	H2S Operating Floor Concentration					
Yes	Yes		AT_131_1	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_2	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_3	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_4	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_5	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_6	LEL Header Floor Concentration					
Yes	Yes		AT_131_7	LEL Header Floor Concentration					
Yes	Yes		AT_131_8	LEL Operating Floor Concentration					
			BVC_221_1A	Pump 221 Discharge Valve Close Command	P_DOut				
			BVC_221_1B	Pump 221 Discharge Valve Emergency Close Command	P_DOut				
			BVC_231_1A	Pump 231 Discharge Valve Close Command	P_DOut				
			BVC_231_1B	Pump 231 Discharge Valve Emergency Close Command	P_DOut				
			BVO_221	Pump 221 Discharge Valve Open Command	P_DOut				
			BVO_231	Pump 231 Discharge Valve Open Command	P_DOut				
	Yes		EB_PROCESS_ELEV		REAL				
	Yes		EB_PROCESS_LEVEL		REAL				
	Yes		JI_BUS_1	SWGR-1 Kilo-Watts/Hr Bus-1	P_AIn				
	Yes		JI_BUS_2	SWGR-1 Kilo-Watts/Hr Bus-2	P_AIn				
			FCVC_213	Plug Valve 213 Close Command	P_DOut				
			FCVC_214	Plug Valve 214 Close Command	P_DOut				
			FCVC_223	Plug Valve 223 Close Command	P_DOut				
			FCVC_224	Plug Valve 224 Close Command	P_DOut				
			FCVC_233	Plug Valve 233 Close Command	P_DOut				
			FCVC_234	Plug Valve 234 Close Command	P_DOut				
			FCVC_243	Plug Valve 243 Close Command	P_DOut				
			FCVC_244	Plug Valve 244 Close Command	P_DOut				
			FCVC_253	Plug Valve 253 Close Command	P_DOut				
			FCVC_254	Plug Valve 254 Close Command	P_DOut				
			FCVO_213	Plug Valve 213 Open Command	P_DOut				
			FCVO_214	Plug Valve 214 Open Command	P_DOut				
			FCVO_223	Plug Valve 223 Open Command	P_DOut				
			FCVO_224	Plug Valve 224 Open Command	P_DOut				
			FCVO_233	Plug Valve 233 Open Command	P_DOut				
			FCVO_234	Plug Valve 234 Open Command	P_DOut				
			FCVO_243	Plug Valve 243 Open Command	P_DOut				
			FCVO_244	Plug Valve 244 Open Command	P_DOut				

Alarm/Events Severity Legend

Alarms Level Groups	Alarm Level Group Names	Severity Ranges
Group 1	Low Priority Alarm	Range 1-250
Group 2	Medium Priority Alarm	Range 251-500
Group 3	High Priority Alarm	Range 501-750
Group 4	Urgent Priority Alarm	Range 751-1000

Alarm/Events Severity Spreadsheet example

Alarm	Tag name	Alarm Description	Data Type	Severity	Notes
x	xxxx	xxxxxxxxxxx	xxx	xxxx	
x	AT_121_1	H2S Bar Screen No.1 Channel High/High High	P_Aln	700=High, 1000=High High	
x	AT_121_2	H2S Bar Screen No.2 Channel High/High High	P_Aln	700=High, 1000=High High	
x	AT_121_3	H2S Bar Screen No.3 Channel High/High High	P_Aln	700=High, 1000=High High	
x	AT_121_4	H2S Bar Screen No.4 Channel High/High High	P_Aln	700=High, 1000=High High	
x	AT_121_5	H2S Bar Screen Room High/High High	P_Aln	700=High, 1000=High High	
x	AT_121_6	H2S East Blue Operating Floor Concentration High/High High	P_Aln	700=High, 1000=High High	
x	AT_121_7	H2S Round Grove Pump Floor Concentration High/High High	P_Aln	700=High, 1000=High High	
x	AT_121_8	H2S Pump Floor Concentration High/High High	P_Aln	700=High, 1000=High High	
x	AT_131_1	LEL Bar Screen No.1 Channel High/High High	P_Aln	700=High, 1000=High High	
x	AT_131_2	LEL Bar Screen No.2 Channel High/High High	P_Aln	700=High, 1000=High High	
x	AT_131_3	LEL Bar Screen No.3 Channel High/High High	P_Aln	700=High, 1000=High High	
x	AT_131_4	LEL Bar Screen No.4 Channel High/High High	P_Aln	700=High, 1000=High High	
x	AT_131_5	LEL Bar Screen Room High/High High	P_Aln	700=High, 1000=High High	
x	AT_131_6	LEL Operating Floor Concentration High/High High	P_Aln	700=High, 1000=High High	
x	AT_131_7	LEL Pump Floor Concentration High/High High	P_Aln	700=High, 1000=High High	
x	AT_131_8	LEL Pump Floor Concentration High/High High	P_Aln	700=High, 1000=High High	
x	BR_WWTP_Comms_Fault_AL	Blue River WWTP Radio Comms Fail	BOOL	750	
x	FIL_221	Pump 221 Seal Water Low Flow	P_Dln	350	
x	FIL_231	Pump 231 Seal Water Low Flow	P_Dln	350	
x	FIT_212	Pump 211 Discharge Flow High/Low	P_Aln	700=High, 350=Low	
x	FIT_222	Pump 221 Discharge Flow High/Low	P_Aln	700=High, 350=Low	
x	FIT_232	Pump 231 Discharge Flow High/Low	P_Aln	700=High, 350=Low	
x	FIT_242	Pump 241 Discharge Flow High/Low	P_Aln	700=High, 350=Low	
x	FIT_252	Pump 251 Discharge Flow High/Low	P_Aln	700=High, 350=Low	
x	LIT_161_1A	East Blue Wetwell Level No.1 Level Low/Low Low	P_Aln	350=Low, 450=Low Low	
x	LIT_161_1B	East Blue Wetwell Level No.2 Level Low/Low Low	P_Aln	350=Low, 450=Low Low	
x	LIT_161_2A	Round Grove Wetwell Level No.1 Low/Low Low	P_Aln	350=Low, 450=Low Low	
x	LIT_161_2B	Round Grove Wetwell Level No.2 Low/Low Low	P_Aln	350=Low, 450=Low Low	
x	LSHH_1	Sump Pit High High Alarm	P_Dln	1000	
x	LSHH_2	Pump Floor High High Alarm	P_Dln	1000	
x	LSH_101	EBWW Wetwell High Level Float	P_Dln	700	
x	LSH_201	RGWW Wetwell High Level Float	P_Dln	700	
x	LSLL211	VFD 211 Low Water Cut Off EBWW	P_Dln	450	
x	LSLL221	ECD 221 Low Water Cut Off EBWW	P_Dln	450	
x	LSLL231	ECD 231 Low Water Cut Off RGWW	P_Dln	450	
x	LSLL241	VFD 241 Low Water Cut Off RGWW	P_Dln	450	
x	LSLL251	VFD 251 Low Water Cut Off RGWW	P_Dln	450	
x	MT211	Pump 211 VFD fail to stop/fail to start	P_VSD	750	
x	MT221	Pump 221 VFD fail to stop/fail to start	P_VSD	750	
x	MT231	Pump 231 VFD fail to stop/fail to start	P_VSD	750	
x	MT241	Pump 241 VFD fail to stop/fail to start	P_VSD	750	
x	MT251	Pump 251 VFD fail to stop/fail to start	P_VSD	750	
x	PI_121	Pump Station Seal Water System Pressure High	P_Aln	700	
x	PI_210	Pump 211 Discharge Pressure High	P_Aln	700	

PLC Programming methods

PLC Programming will be a combination of Ladder and Function Block formats derived from the ACM.

Layout

Under the “Tasks” Folder only the following tasks will be used.

- Task_C_250ms
- Task_D_500ms
- _Controller_Status

Task_C_250ms, use is for all programs added that are not part of the ACM generated program. Example: Global Equipment Controls, Controls migrated from other PLCs, Alternators, First_Pass Routines, IO_Mapping, PLC to PLC Messages, etc.

Task_D_500ms, use is for all ACM generated programs and process/equipment driven controls. Example: Single Pump Control, DI, DO, AI, AO, Flows, Pressures, etc.

_Controller_Status, use is for monitoring and troubleshooting PLC through status of Tasks and PLC Processor functions. PLC Processor functions/status will be monitored through the appropriate AOI “L_CPU_24_Up”.

Note: Delete all unused Tasks that were generated by the ACM.

PLC Memory Map (if used)

Controller Tags are used in PLC programming. Program Tags will not be used because the HMI will not be able to see them through the Communication network (They are not Global). Symbolic Tags with data type BOOL, REAL, and INT will be used.

PLC to PLC Comms using a Data Concentrator (DC) over Ethernet Radio

The main purpose of this section is to set standards for PLC to PLC data exchange for the Allen Bradley ControlLogix/Compact Logix PLC’s on the KCMO Scada Ethernet network. This section provides information for PLC programmers to share data on the Ethernet network to be used by other PLC’s in the event the Scada systems remote sites are communicating over Radios.

There are multiple PLC’s located throughout the Kansas City Area and some will need to exchange data with each other over Radios. Since an HMI/OIT Global Object must connect directly to the PLC’s AOI Radios does not have enough band width to exchange the data efficiently to maintain connectivity. For example, a Pump Station PLC Comms to a respective WWTP Scada system is over an Ethernet Radio. To resolve this issue there needs to be a Data Concentrator PLC (DC_PLC) designated for making the Produced/Consumed Tag Memory

Mapping. Rockwell has an example PLC code and an HMI application. Using this method, it will not be possible for Remote Control of Sites. Sites will be “Read” only.

PLC to PLC Communications

The main purpose of this section is to set standards for PLC to PLC data exchange for the Allen Bradley ControlLogix PLC’s on the Ethernet network at KCMO WWTPs. This section provides information for PLC programmers to share data on the Ethernet network to be used by other PLC’s. This section will not discuss the data exchange between PLC and HMI.

There are multiple PLC’s located throughout each WWTP and some will need to exchange data with each other. For example, a chemical feed PLC may need the plant flow value from another PLC to properly flow pace chemicals.

Data Transfer Method

Message Blocks are the way chosen to transfer data from Allen Bradley ControlLogix PLCs to other Allen Bradley ControlLogix or CompactLogix PLCs on the Ethernet network.

The PLCs that need the Data will Read the Data using a Message Block. The Logic will be written to produce a “Comm Fail” if the Message Block returns an Error. This Comm Fail will then Halt or Terminate the Process the data was intended for.

Data Transfer Addressing

PLCs that need Data and Produce Data will include Arrays to be read from by the Plant PLCs on the Ethernet network. Each PLC will allocate a memory Array of 100 registers for each data type. The name for these Arrays will be the same on each end (Plant PLC requesting Data and the PLC it's transferring with). See Table below for details.

Starting Address	Length	Description
PPP_DATA_READ_DIGITAL_INT[0]	100	Facility Abbreviation Data Read Digital Integers
PPP_DATA_READ_ANALOG_INT[0]	100	Facility Abbreviation Data Read Analog Integers
PPP_DATA_READ_REAL[0]	100	Facility Abbreviation Data Read Floats
BR_NEID_DATA_READ_DIGITAL_INT[0]	100	Blue River WWTP NEID PS Data Read Digital Integers
BR_NEID_DATA_READ_REAL[0]	100	Blue River WWTP NEID PS Data Read Floats

Table 15 - Data Exchange Address Allocation

Plant PLC Name	Area	Area PLC Names
P651PMPPLC01	Pump Station	N/A
P658PMPPLC01	Pump Station	N/A
P710DIGPLC01	Digester	N/A
P710DIGPLC02	Transfer Area	N/A
P658GRSCPLC01	Screening	N/A
P701PRIPLC01	Sludge House	N/A
P701PRIPLC02	Sludge House	N/A
P702BIOPLC01	Sludge Collection	N/A
P702DISPLC01	Chemical System	N/A
P620PMPPLC01	Pump Station	N/A
P702PMPPLC01	Pump Station	N/A

Table 16– Plant PLCs and Their Area PLCs

Ethernet MSG Configuration

Each Plant PLC that has Area PLCs will have a Message Block as needed, along with a Timer/Done/Error bit to step through the Message Blocks.

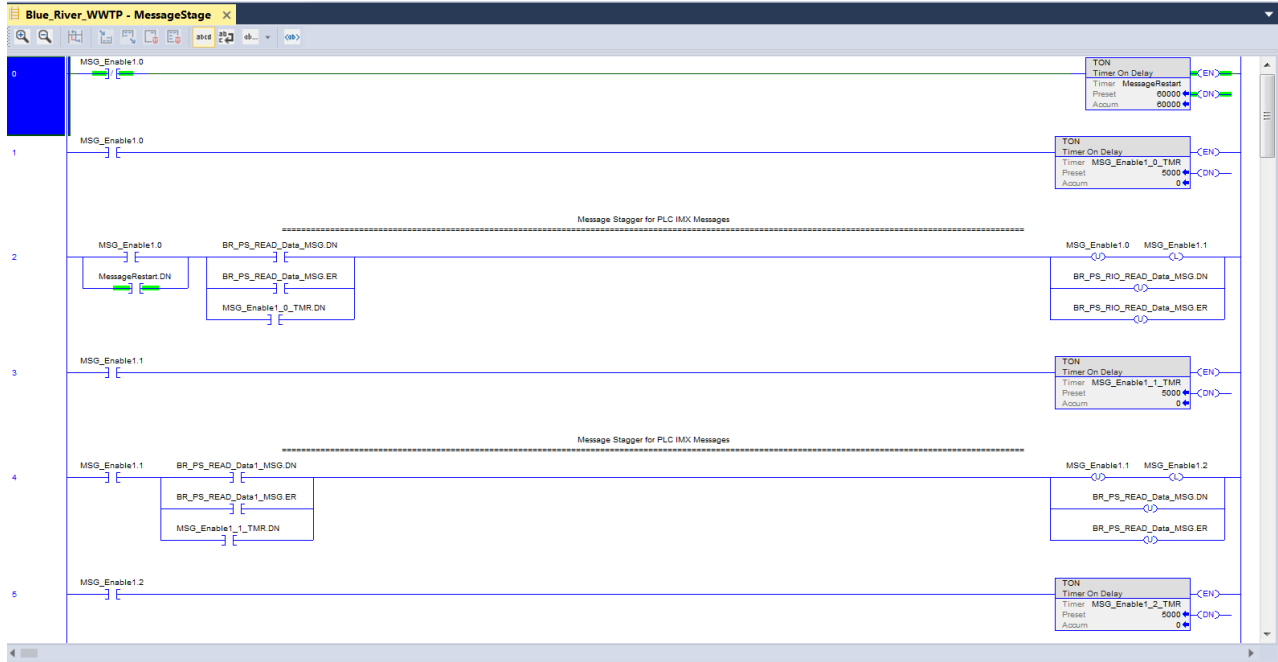


Figure 38 - Ethernet MSG Staging

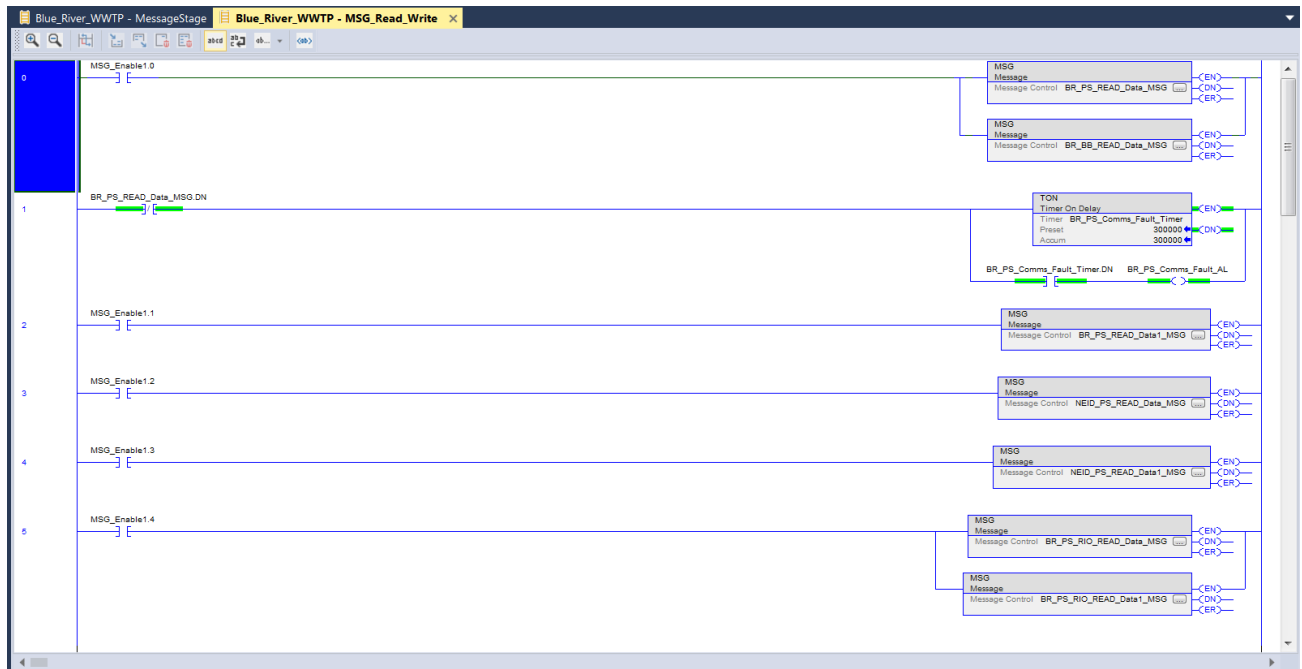


Figure 39 - Ethernet MSG Configuration

Data Transfer Format

The data transferred using the MSG must be in the following format.

The supplier of the PLC will maintain and provide a detailed list (including ranges) of the points it is providing to be Read and be used by other PLCs, included in the list will be the Data it needs from other PLCs.

Integer words (qty of 10 minimum) DATA_IN_PPP_PLC#####_INT[0] thru [9] will be used for bits, starting at DATA_IN_PPP_PLC#####_INT[0].0 and DATA_TO_PPP_PLC#####_INT[0].0

Integers are used for Raw scaling (0-100%) values to and from each PLC. The Raw values are then inputs into each PlantPax Add On Instruction. In each AOI the Raw value is then scaled to the Engineering units for displaying on Scada Screens.

Tagname	Type	Range	Description
BR_NEID_DATA_READ_DIGITAL_INT[0].0	Bool		Bar Screen 1 Run
BR_NEID_DATA_READ_DIGITAL_INT[0].1	Bool		Bar Screen 1 In Remote
BR_NEID_DATA_READ_DIGITAL_INT[0].2	Bool		Bar Screen 1 Fail
BR_NEID_DATA_READ_DIGITAL_INT[0].3	Bool		Bar Screen 1 High Level
BR_NEID_DATA_READ_DIGITAL_INT[0].4	Bool		Bar Screen 1 Low Level
BR_NEID_DATA_READ_DIGITAL_INT[0].5	Bool		Bar Screen 1 High Differential
BR_NEID_DATA_READ_DIGITAL_INT[0].6	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].7	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].8	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].9	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].10	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].11	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].12	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].13	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].14	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[0].15	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[1].0	Bool		
BR_NEID_DATA_READ_DIGITAL_INT[1].1	Bool		
BR_NEID_DATA_READ_ANALOG_INT[0]	Real	0-100%	Bar Screen 1 Channel Level
BR_NEID_DATA_READ_ANALOG_INT [0]	Real	0_100%	Bar Screen 1 Differential Pressure
BR_PS_DATA_READ_DIGITAL_INT[0].0	Bool		Channel 1 Enabled
BR_PS_DATA_READ_DIGITAL_INT[0].1	Bool		Gate 1 Open
BR_PS_DATA_READ_ANALOG_INT[0]	Real	0-100%	Influent Channel 1 Flow
BR_PS_DATA_READ_ANALOG_INT[1]	Real	0-100%	Gate 1 Position

Table 17 - Data Transfer Worksheet Example

I/O and Control Loop Checkout Spreadsheet Example

I/O Checkout Spreadsheet Example

An I/O Checkout Spreadsheet is produced for keeping track of all I/O produced checked by Integrator/City/Engineers throughout the PLC upgrade process.

RACK	SLOT	CH.	I/O	Shortcut	Tag Name	Description	RANGE	UNITS	LOOP NO	Target	Measured on OIT MM/DD/YY	Measured on MM/DD/YY	Unwitnessed FDT Pass MM/DD/YY	Witnessed FDT Pass MM/DD/YY	Unwitnessed SDT Pass MM/DD/YY	Witnessed SDT Pass MM/DD/YY	Unwitnessed SAT Pass MM/DD/YY	Witnessed SAT Pass MM/DD/YY
XXXX	X	X	XX	XXXXXXXXXX	XXXXXX	XXXXXXXXXXXXXXXX	XXX	XX	XXXXXX									
1_2	2	0	DI	P669PMPLCD1	YL_101_1A	Slide Gate 101 HOA in Remote	n/a	n/a	GAT-101	On/Off								
1_2	2	1	DI	P669PMPLCD1	YL_101_1B	Slide Gate 101 HOA in Local	n/a	n/a	GAT-101	On/Off								
1_2	2	2	DI	P669PMPLCD1	ZSC_101	Slide Gate 101 Closed	n/a	n/a	GAT-101	On/Off								
1_2	2	3	DI	P669PMPLCD1	ZSO_101	Slide Gate 101 Opened	n/a	n/a	GAT-101	On/Off								
1_2	2	4	DI	P669PMPLCD1	YL_102_1A	Slide Gate 102 HOA in Remote	n/a	n/a	GAT-102	On/Off								
1_2	2	5	DI	P669PMPLCD1	YL_102_1B	Slide Gate 102 HOA in Local	n/a	n/a	GAT-102	On/Off								
1_2	2	6	DI	P669PMPLCD1	ZSC_102	Slide Gate 102 Closed	n/a	n/a	GAT-102	On/Off								
1_2	2	7	DI	P669PMPLCD1	ZSO_102	Slide Gate 102 Opened	n/a	n/a	GAT-102	On/Off								
1_2	2	8	DI	P669PMPLCD1	YL_105_1A	Slide Gate 105 HOA in Remote	n/a	n/a	GAT-105	On/Off								
1_2	2	9	DI	P669PMPLCD1	YL_105_1B	Slide Gate 105 HOA in Local	n/a	n/a	GAT-105	On/Off								
1_2	2	10	DI	P669PMPLCD1	ZSC_105	Slide Gate 105 Closed	n/a	n/a	GAT-105	On/Off								
1_2	2	11	DI	P669PMPLCD1	ZSO_105	Slide Gate 105 Opened	n/a	n/a	GAT-105	On/Off								
1_2	2	12	DI	P669PMPLCD1	YL_141_1A	Slide Gate 141 HOA in Remote	n/a	n/a	GAT-141	On/Off								
1_2	2	13	DI	P669PMPLCD1	YL_141_1B	Slide Gate 141 HOA in Local	n/a	n/a	GAT-141	On/Off								
1_2	2	14	DI	P669PMPLCD1	ZSC_141	Slide Gate 141 Closed	n/a	n/a	GAT-141	On/Off								
1_2	2	15	DI	P669PMPLCD1	ZSO_141	Slide Gate 141 Opened	n/a	n/a	GAT-141	On/Off								
1_2	3	0	DI	P669PMPLCD1	YL_142_1A	Slide Gate 142 HOA in Remote	n/a	n/a	GAT-142	On/Off								
1_2	3	1	DI	P669PMPLCD1	YL_142_1B	Slide Gate 142 HOA in Local	n/a	n/a	GAT-142	On/Off								
1_2	3	2	DI	P669PMPLCD1	ZSC_142	Slide Gate 142 Closed	n/a	n/a	GAT-142	On/Off								
1_2	3	3	DI	P669PMPLCD1	ZSO_142	Slide Gate 142 Opened	n/a	n/a	GAT-142	On/Off								
1_2	3	4	DI	P669PMPLCD1	YL_111_1A	Bar Screen 111 HOA in Remote	n/a	n/a	LCP-BSC-111	On/Off								
1_2	3	5	DI	P669PMPLCD1	YL_111_1B	Bar Screen 111 HOA in Local	n/a	n/a	LCP-BSC-111	On/Off								
1_2	3	6	DI	P669PMPLCD1	YL_111_1C	Bar Screen 111 Running	n/a	n/a	LCP-BSC-111	On/Off								
1_2	3	7	DI	P669PMPLCD1	YA_111	Bar Screen 111 Fail	n/a	n/a	LCP-BSC-111	On/Off								
1_2	3	8	DI	P669PMPLCD1	YL_112_1A	Bar Screen 112 HOA in Remote	n/a	n/a	LCP-BSC-112	On/Off								
1_2	3	9	DI	P669PMPLCD1	YL_112_1B	Bar Screen 112 HOA in Local	n/a	n/a	LCP-BSC-112	On/Off								
1_2	3	10	DI	P669PMPLCD1	YL_112_1C	Bar Screen 112 Running	n/a	n/a	LCP-BSC-112	On/Off								
1_2	3	11	DI	P669PMPLCD1	YA_112	Bar Screen 112 Fail	n/a	n/a	LCP-BSC-112	On/Off								
1_2	3	12	DI	P669PMPLCD1	YL_UPS_1	PLC UPS Ok	n/a	n/a	UPS-EB-1	On/Off								
1_2	3	13	DI	P669PMPLCD1	YA_UPS_1A	PLC UPS Fail	n/a	n/a	UPS-EB-1	On/Off								
1_2	3	14	DI	P669PMPLCD1	YA_UPS_1B	PLC UPS Battery Fail	n/a	n/a	UPS-EB-1	On/Off								
1_2	3	15	DI	P669PMPLCD1	YA_UPS_1C	PLC UPS Battery Warning	n/a	n/a	UPS-EB-1	On/Off								
1_2	4	0	DI	P669PMPLCD1	YL_103_1A	Slide Gate 103 HOA in Remote	n/a	n/a	GAT-103	On/Off								
1_2	4	1	DI	P669PMPLCD1	YL_103_1B	Slide Gate 103 HOA in Local	n/a	n/a	GAT-103	On/Off								
1_2	4	2	DI	P669PMPLCD1	ZSC_103	Slide Gate 103 Closed	n/a	n/a	GAT-103	On/Off								
1_2	4	3	DI	P669PMPLCD1	ZSO_103	Slide Gate 103 Opened	n/a	n/a	GAT-103	On/Off								
1_2	4	4	DI	P669PMPLCD1	YL_104_1A	Slide Gate 104 HOA in Remote	n/a	n/a	GAT-104	On/Off								
1_2	4	5	DI	P669PMPLCD1	YL_104_1B	Slide Gate 104 HOA in Local	n/a	n/a	GAT-104	On/Off								
1_2	4	6	DI	P669PMPLCD1	ZSC_104	Slide Gate 104 Closed	n/a	n/a	GAT-104	On/Off								

Control Loop Checkout Spreadsheet Example

A Control Loop Checkout Spreadsheet is produced for keeping track of any Control Loops produced checked by Integrator/City/Engineers throughout the PLC upgrade process.

TAG	LOOP Number	DESCRIPTION	RANGE	UNITS	P&ID REF	SPEC REF	Result	Measured on OIT MM/DD/YY	Measured on HMI MM/DD/YY	Unwitnessed FDT Pass MM/DD/YY	Witnessed FDT Pass MM/DD/YY	Unwitnessed SDT Pass MM/DD/YY	Witnessed SDT Pass MM/DD/YY	Unwitnessed SAT Pass MM/DD/YY	Witnessed SAT Pass MM/DD/YY
XXXX	_XX	XXXXXXXXXXXXXXXX	XXX	XX	X-XX	XXXXX									
GAT	101	Round Grove Gate 101 Remote Manual Mode			I-3 and I-4	16916 pg18	Open								
GAT	101	Round Grove Gate 101 Remote Manual Mode			I-3 and I-4	16916 pg18									
GAT	101	Round Grove Gate 101 Remote Manual Mode			I-3 and I-4	16916 pg18	Close								
GAT	101	Round Grove Gate 101 Alarms			I-3 and I-4	16916 pg18	Alarm Indicators								
GAT	101	Round Grove Gate 101 Status Indicators			I-3 and I-4	16916 pg18	Status Indicators								
GAT	101	Round Grove Gate 101 HMI Requirements			I-3 and I-4	16916 pg18	HMI Requirements								
GAT	102	Round Grove Gate 102 Remote Manual Mode			I-3 and I-4	16916 pg18	Open								
GAT	102	Round Grove Gate 102 Remote Manual Mode			I-3 and I-4	16916 pg18									
GAT	102	Round Grove Gate 102 Remote Manual Mode			I-3 and I-4	16916 pg18	Close								
GAT	102	Round Grove Gate 102 Alarms			I-3 and I-4	16916 pg18	Alarm Indicators								
GAT	102	Round Grove Gate 102 Status Indicators			I-3 and I-4	16916 pg18	Status Indicators								
GAT	102	Round Grove Gate 102 HMI Requirements			I-3 and I-4	16916 pg18	HMI Requirements								
GAT	103	Round Grove Gate 103 Remote Manual Mode			I-3 and I-4	16916 pg22	Open								
GAT	103	Round Grove Gate 103 Remote Manual Mode			I-3 and I-4	16916 pg22									
GAT	103	Round Grove Gate 103 Remote Manual Mode			I-3 and I-4	16916 pg22	Close								
GAT	103	Round Grove Gate 103 Alarms			I-3 and I-4	16916 pg22	Alarm Indicators								
GAT	103	Round Grove Gate 103 Status Indicators			I-3 and I-4	16916 pg22	Status Indicators								
GAT	103	Round Grove Gate 103 HMI Requirements			I-3 and I-4	16916 pg22	HMI Requirements								
GAT	104	Round Grove Gate 104 Remote Manual Mode			I-3 and I-4	16916 pg22	Open								
GAT	104	Round Grove Gate 104 Remote Manual Mode			I-3 and I-4	16916 pg22									
GAT	104	Round Grove Gate 104 Remote Manual Mode			I-3 and I-4	16916 pg22	Close								
GAT	104	Round Grove Gate 104 Alarms			I-3 and I-4	16916 pg22	Alarm Indicators								
GAT	104	Round Grove Gate 104 Status Indicators			I-3 and I-4	16916 pg22	Status Indicators								
GAT	104	Round Grove Gate 104 HMI Requirements			I-3 and I-4	16916 pg22	HMI Requirements								
GAT	105	Round Grove Gate 105 Remote Manual Mode			I-3 and I-4	16916 pg18	Open								
GAT	105	Round Grove Gate 105 Remote Manual Mode			I-3 and I-4	16916 pg18									
GAT	105	Round Grove Gate 105 Remote Manual Mode			I-3 and I-4	16916 pg18	Close								

SECTION 13500 APPENDIX B – EXAMPLE TEST FORMS

PART 1 – GENERAL

1.01 SUMMARY

- A. This appendix includes example test forms. The example test forms are not intended to be complete or comprehensive. The I&C System Supplier shall edit and/or supplement the forms with their standard documentation to meet the requirements for testing and test forms in section 13500 Instrumentation and Control System and other Contract Documents.

PART 2 - PRODUCTS

- A. See below for example test forms.

FACTORY ACCEPTANCE TEST - CONTROL PANELS CHECKLIST

1. GENERAL INSPECTION

A. Structural Inspection

- Verify Lifting Lugs Installed
- Verify enclosure has lock and lock is functional
- Confirm that seismic bracing components are provided per manufacturer's installation instructions

B. Exterior Inspection

- Cabinet exterior is clean, scratch, and dent free
- Inspect externally for corrosion and damage
- Verify enclosure door opens and closes easily
- Verify enclosure has a 3-point latch
- Verify enclosure has a flange mounted disconnect (where voltages greater than 120 VAC enter the cabinet)
- Verify enclosure has the appropriate NEMA rating (1, 1G, 12, 3R, 4, 4X, etc.)
- Verify enclosure is the appropriate size (not grossly larger than design, and will still fit in the plant)

Nameplates

- Cabinet has identification nameplate
- All door labels are straight, spelled correctly, and match the tagging defined in the Contract Cabinet has a nameplate that includes the following:

- | | |
|--|---|
| <input type="checkbox"/> Power source(s) | <input type="checkbox"/> Integrator's Logo |
| <input type="checkbox"/> Circuit ID(s) | <input type="checkbox"/> Short Circuit KAIC ratings |

If labels are screwed to door, silicone was utilized to cover screw holes (Labels screwed to the door of a NEMA 4/4X panel technically violates the NEMA rating.)

Door Devices

- All devices penetrating the outside of panel have gaskets, silicone, or both.
- All door devices are installed (OITs, Pilot Devices, etc.).
- Door mounted equipment is mounted straight and square.
- All exterior or door mounted equipment present and accounted for, installed, and securely fastened NEMA classification has not been violated due to penetrations.
- Door mounted equipment has the same NEMA rating as the panel.
- All door mounted equipment installed at the correct height.
- All door mounted equipment installed in the correct positions and order (layout of door mounted equipment is grouped properly and in a logical manner).
- Doors with multiple penetrations have adequate bracing (if needed).
- Visually check condition of indicators, controllers, and annunciators
- Check that pilot lights illuminate correctly, push-to-test function of each light, and ensure pilot light color

PROJECT NAME: _____	TEST DATE: _____
FACILITY NAME: _____	TESTED BY: _____
PROCESS AREA: _____	COMPANY: _____
NETWORK ID: _____	PAGE: _____
WITNESSED BY: _____	SIGNATURE: _____

FACTORY ACCEPTANCE TEST - CONTROL PANELS CHECKLIST

GENERAL INSPECTION (continued)

Peripheral Devices

- Horn / Beacon is installed (where required)
- Silence and Reset pushbutton

C. Interior Inspection

- Cabinet is cleaned of marks and dirt.
- Inspect internally for corrosion and damage.
- Back panel is clean of marks and dirt.
- Interior of panel vacuumed and free of all debris.
- Check that the panel roof is clean and clear of foreign materials.
- Bottom of panel has been cut out (where bottom entry is required), with angle iron welded around the bottom perimeter. Re-painting has been performed.
- If internal light door limit switch is provided, ensure the light automatically turns "on" when the doors are open.
- Intrusion alarms (where required).

Interior Labeling

- All panel mounted equipment has identification labeling, by using Phenolic type tags.
- Verify that door mounted components are mounted square and symmetrical.
- Verify that nameplates are straight, legible, and spelled correctly.
- All terminal blocks are identified/labeled with permanent labels including tight end blocks and caps. All wiring shrink labeled and or phased correctly to the specifications.
- All wire labels shrunk completely rotated and aligned alike for easy identification.
- All fuses and circuit breakers are labeled with ID and current rating.
- System Integrator's label or labels installed on door.
- Panel manufacturer model/serial number tag is present.
- All required safety/warning tags installed and straight.
- Correct UL (typically UL 508) or cUL tag installed and registered and all other associated tags installed and straight (the UL tag might not be installed in the panel at the factory test. If the panel is modified due to changes during the factory test or a punch list generated from the factory test, the UL labeling would need to be re-applied. Some UL shops do not apply the UL label until the panel is released to be shipped.).

Wireways

- Plastic wire way covers installed properly.
- Plastic wireways have no sharp edges.
- No wire Ties inside the wireways.
- No sharp edges on wire ties.
- Separation: White duct is used for DC voltages, Gray duct is used for AC voltages.
- Ensure wiring duct is not over-full, includes provision for 20% more wiring and the cover may easily be installed. Panduit recommends 50% duct fill, but 40% is a better practice.

PROJECT NAME: _____	TEST DATE: _____
FACILITY NAME: _____	TESTED BY: _____
PROCESS AREA: _____	COMPANY: _____
NETWORK ID: _____	PAGE: _____
WITNESSED BY: _____	SIGNATURE: _____

FACTORY ACCEPTANCE TEST - CONTROL PANEL CHECKLIST

1. GENERAL INSPECTION (continued)

C. Interior Inspection (continued) Wiring

- Visually check terminals and condition of internal wirings.
- Verify that the control panel has been assembled and wired as designed.
- Verify that all components are operational and perform the functions intended.
- Verify that all components are sized appropriately for the application.
- Verify that equipment control circuits function as intended.
- Back of door wiring is labeled and neatly formed.
- Back panel to door wiring has sufficient bending radius with spiral wrap.
- Wire connection has been verified wired to correct points within the panel.
- Individual wires have been given a pull test to verify a good terminal connection.
- Wire and cable minimum bending radius have not been violated.
- All equipment installed straight and square to back panel.
- Wire colors are correct:
 - Black and White = AC hot and neutral
 - Red = AC control signals
 - Blue = DC power and control (Blue w/White stripe for DC ground)
 - Yellow = Foreign voltages (those still present when panel power is disconnected)
 - Green = AC equipment ground
 - Black = TSP (+)
 - White = TSP (-)
- Analog wiring shields are continuous (connected by a dedicated terminal block for such shields).
- Analog shield wires are grounded within the panel, where not otherwise grounded at the transmitter itself.
- Discrete inputs are separately fused or protected by a circuit breaker on a "per loop" basis.
- Intrinsic Safety Wiring
 - Ensure wiring associated with intrinsic safety circuits or intrinsic safety barriers is kept away from all other wiring by UL minimum distances or by a physical (grounded metal) barrier preventing non-intrinsically safe wiring from coming in contact with intrinsically safe circuits or wiring.
- Verify all spare terminals are installed according to the percentage listed in the specifications

Grounding

- Equipped with "Blackburn" or other grounding type lug.
- Lug is securely fastened to the panel structure
- Verify Grounding bar is installed
- Verify Isolated ground bar is installed

PROJECT NAME: _____
 FACILITY NAME: _____
 PROCESS AREA: _____
 NETWORK ID: _____
 WITNESSED BY: _____

TEST DATE: _____
 TESTED BY: _____
 COMPANY: _____
 PAGE: _____

SIGNATURE: _____

FACTORY ACCEPTANCE TEST - CONTROL PANELS CHECKLIST

2. POWER TEST

A. AC Power

- AC Power is routed correctly within the panel, and is isolated from DC and network wiring.
- All fuses are installed and sized properly.
- All breakers are installed and sized properly. 24 VDC Power Supplies are functional.
- 24 VDC Power fail contacts are functional.
- 24 VDC power supplies are redundant and have diode modules enabling the hot swap-over between supplies.
 - 24 VDC supplies are equipped with dry contact failure alarms, wired as PLC inputs to signal failure of any DC power supply. Such alarm inputs to the PLC have been tested as being functional.
- Dedicated receptacle is wired to receive a dedicated AC supply.
- Verify continuity for all DC commons, ground, and AC neutrals.
- Verify that the CP temporary input power is connected correctly and is the correct voltage.
- Close the CP main circuit breaker(s).
- Verify that voltages at subsequent circuit breakers are correct.
- Close circuit breakers.
- Verify that power feeding interruptible and uninterruptible power supplies is correct.
- Turn on power supplies if they are not already on.
- Verify that voltages at distribution terminals are correct.
- Energize any remaining hardware such as the PLC.

B. Uninterruptible Power Supply (UPS)

- Mounted appropriately within the cabinet, on a dedicated shelf, or rear of a swing-out sub panel.
- Is equipped with maintenance bypass switch (or at least plug/receptacle means for bypassing the unit).
- Test all UPS alarms (on inverter, failure, battery failure etc.)
- Turn off the AC power supply and verify that the UPS will be switched on to supply the designated vital loads in the control panel.

3. CONTROLS & AUXILIARY DEVICES TEST

- Verify all interposing and auxiliary relays are functioning.
- Verify panel lights are functioning.

Ventilation and Heating

- If ventilation fans are fitted, check the fans operate correctly any associated air filters are clean and not blocked.
- Verify components are installed in the correct orientation for proper air flow.

4. HARDWIRED INTERLOCK AND SAFETY TEST

- Verify that hardwired interlocks through the control panel as shown on schematic drawings are functioning. For example, outlet high pressure switch interlock to a pump.
- Verify that all hardwired safety devices through the control panel is functioning (ex. pull cord ESTOP for conveyors).

PROJECT NAME: _____	TEST DATE: _____
FACILITY NAME: _____	TESTED BY: _____
PROCESS AREA: _____	COMPANY: _____
NETWORK ID: _____	PAGE: _____
WITNESSED BY: _____	SIGNATURE: _____

FACTORY ACCEPTANCE TEST - CONTROL PANELS CHECKLIST

5. PLC TEST

A. Components

- PLC interior High Temperature alarm is installed, wired to the PLC, and is shown to be functional.
- Relays have transient suppression across their coils. This is particularly important for DC coil relays, where diodes in reverse polarity are often used.
- TVSS is installed across the main incoming 120 VAC.

PLC and PLC Rack

- Verify all cards are securely seated.
- Ensure clearance around PLC rack has been met, such that convective heat transfer is not impeded by devices erroneously mounted in the “no encroachment” area. Confirm with manufacturer clearance recommendations.

B. PLC I/O Test

Furnish **I/O test forms** and test all the listed input and output points as follows:

- Discrete Inputs: Simulate a field contact closure by “shorting” across the appropriate terminal blocks. Observe the transition between a logical “0” and “1” in the PLC software.
- Discrete Outputs: Force the output bit to toggle between logical “0” and logical “1” using the PLC software. Measure contact resistance at the wired terminal blocks using a digital meter selected for the “ohms” setting.
- Analog Inputs: Connect a signal generator to the appropriate terminal blocks. Tailor the connection depending on whether a 2-wire or 4-wire simulation is required. Modulate the 4-20mA signal. Observe the associated PLC internal memory register to transition between 0-65535 or if scaled in engineering units, between 0 and the maximum scaled engineering unit. The latter method is preferred.
- Analog Outputs: Force the output register to a value between 0-65535 or 0-100% (if the scaling block can be manipulated). Observe the measured 4-20mA value increment and decrement using a digital ammeter.

C. Redundant Controllers (where required) Test

- Remove Communication cable from PLC-1 to verify switching to PLC-1A.
- Remove Communication cable from PLC-1A to verify switching back to PLC-1
- Remove Power from PLC-1 to verify switching to PLC-1A
- Remove Power from PLC-1A to verify switching to PLC-1.
- Remove Communication cable from PLC-1 to I/O rack and verify switching to PLC-1A.
- Remove Communication cable from PLC -1A to I/O rack and verify switching to PLC-1.

PROJECT NAME: _____
 FACILITY NAME: _____
 PROCESS AREA: _____
 NETWORK ID: _____
 WITNESSED BY: _____

TEST DATE: _____
 TESTED BY: _____
 COMPANY: _____
 PAGE: _____

SIGNATURE: _____

A. PLC Control Logic Verification

The PLC control strategy is verified as indicated in section 13500 Instrumentation and Control System. Each control strategy will be verified by simulating the process and checking the state or value of PLC outputs. The results of equipment status and alarms and process instrument values and trends shall also be verified on the Plant SCADA graphic screens stored in a temporary SCADA computer.

- Discrete input states are either simulated by hardwired switches or forced inputs using a programming terminal. For example, when starters and drives are not provided as part of the contract, jumpers may be installed from the output call relays to the running confirmation inputs to simulate the running state of the motors.
- Analog input values are either simulated by an external source or within software using a programming terminal. For example, when a level transducer is not provided as part of the contract the level transducer loop current may be simulated with a loop powered potentiometer and adjusted manually for the level input.

Typical Fault Logic

If the fault input is high and the disable (if applicable) for the fault is not high and the common disable (if applicable) is not high begin timing. If any of these conditions changes, stop timing and reset the timer. If the timer reaches its preset, activate the alarm output. If the fault alarm is a shutdown alarm stop the associated motor and latch the alarm so that it remains present even if the condition clears.

The fault condition must return to normal and the alarm must be reset for a latched alarm to clear.

Typical Fail to Start Logic

If the motor is called to run (call output high) and no running feedback is received (running input is low) and the fail to start and common alarm disables (if applicable) are not high start timing. If any of these conditions changes, stop timing and reset the timer. If the timer reaches its preset, activate the alarm output, stop calling the motor and latch the alarm.

B. HMI AND OIT TEST

HMI / OIT Functionality

- Verify communication with PLC.
- Verify the following operations on each screen:
 - Screen-to-screen navigation.
 - Set Point Entry Animation
 - Color Correctness (Green=Run, Red=Off, Amber=Alarm, or the agreed upon convention)
 - Alarms appear on screen and in alarm log.
 - Acknowledge and reset all alarms.
 - Security / Access Levels / Passwords.

C. NETWORK COMMUNICATION TEST

Network Components

- Fiber optic cabling terminates in a patch panel
- Media converters are installed and functional
- Terminating resistors have been installed for trunk/tap topologies or where required.
- Wire and cable bending limitations have not been violated

Networking Functions

- Verify data transfer via the network to different PLCs as shown on the Network Block Diagrams.
- Verify network traffic rate and error margin is acceptable

PROJECT NAME: _____	TEST DATE: _____
FACILITY NAME: _____	TESTED BY: _____
PROCESS AREA: _____	COMPANY: _____
NETWORK ID: _____	PAGE: _____
WITNESSED BY: _____	SIGNATURE: _____

FACTORY ACCEPTANCE TEST – CONTROL PANELS CHECKLIST

A. FACTORY ACCEPTANCE CONTROL PANEL TEST DOCUMENTATION

- As-built panel drawings showing actual panel construction and devices arrangement and c/w Bill of Material.
- Panel schematic and interconnection drawings.
- P&ID drawings and schematic drawings for the process area controlled by the panel that is to be tested.
- I/O list test forms of the process area to be tested.
- Source test procedure of the process area to be tested.
- Test record forms of the process area to be tested. Forms shall include area for signature of responsible test personnel.
- Hard copy of the PLC application program of the process area to be tested.
- Hard copy of the HMI/OIT graphic screens of the process area to be tested.

B. FACTORY ACCEPTANCE TEST TOOLS AND SOFTWARE

- Simulation software and documentation (if required).
- Digital volt meter (Fluke or approved equal)
- Hardware simulators
- Laptop computer with PLC application program
- Temporary SCADA computer with HMI software and applicable graphic screens
- Jumper wires

PROJECT NAME: _____	TEST DATE: _____
FACILITY NAME: _____	TESTED BY: _____
PROCESS AREA: _____	COMPANY: _____
NETWORK ID: _____	PAGE: _____
WITNESSED BY: _____	SIGNATURE: _____

	INSTALLATION AND CERTIFICATION CHECKLIST DOCUMENTATION	
--	---	--

INSTRUMENT LOOP NO. _____

SERVICE DESCRIPTION _____

A COPY OF LATEST ISSUE OF THE FOLLOWING DOCUMENTS ARE INCLUDED IN THIS INSTRUMENT INSTALLATION CERTIFICATION FILE:

- INSTRUMENT SPECIFICATION SHEETS (FOR ALL INSTRUMENTS IN THE LOOP)
- INSTRUMENT INSTALLATION DETAILS (FOR ALL INSTRUMENTS IN THE LOOP)
- INSTRUMENT LOOP WIRING DIAGRAMS
- INSTRUMENT INSTALLATION CERTIFICATION CHECKLIST
- SIZING CALCULATIONS
- INSTRUMENT INSTALLATION SCHEDULE (APPLICABLE PART)
- NAMEPLATE SCHEDULE (APPLICABLE PART)
- VENDOR LITERATURE CALIBRATION INFORMATION

INSTRUMENT LOOP IS PART OF EQUIPMENT START-UP/SHUTDOWN INTERLOCKS? No Yes

REMARKS: _____

CHECKED BY I&C SYSTEMS SUPPLIER

ACCEPTED BY ENGINEER OR OWNER

SIGNATURE _____

SIGNATURE _____

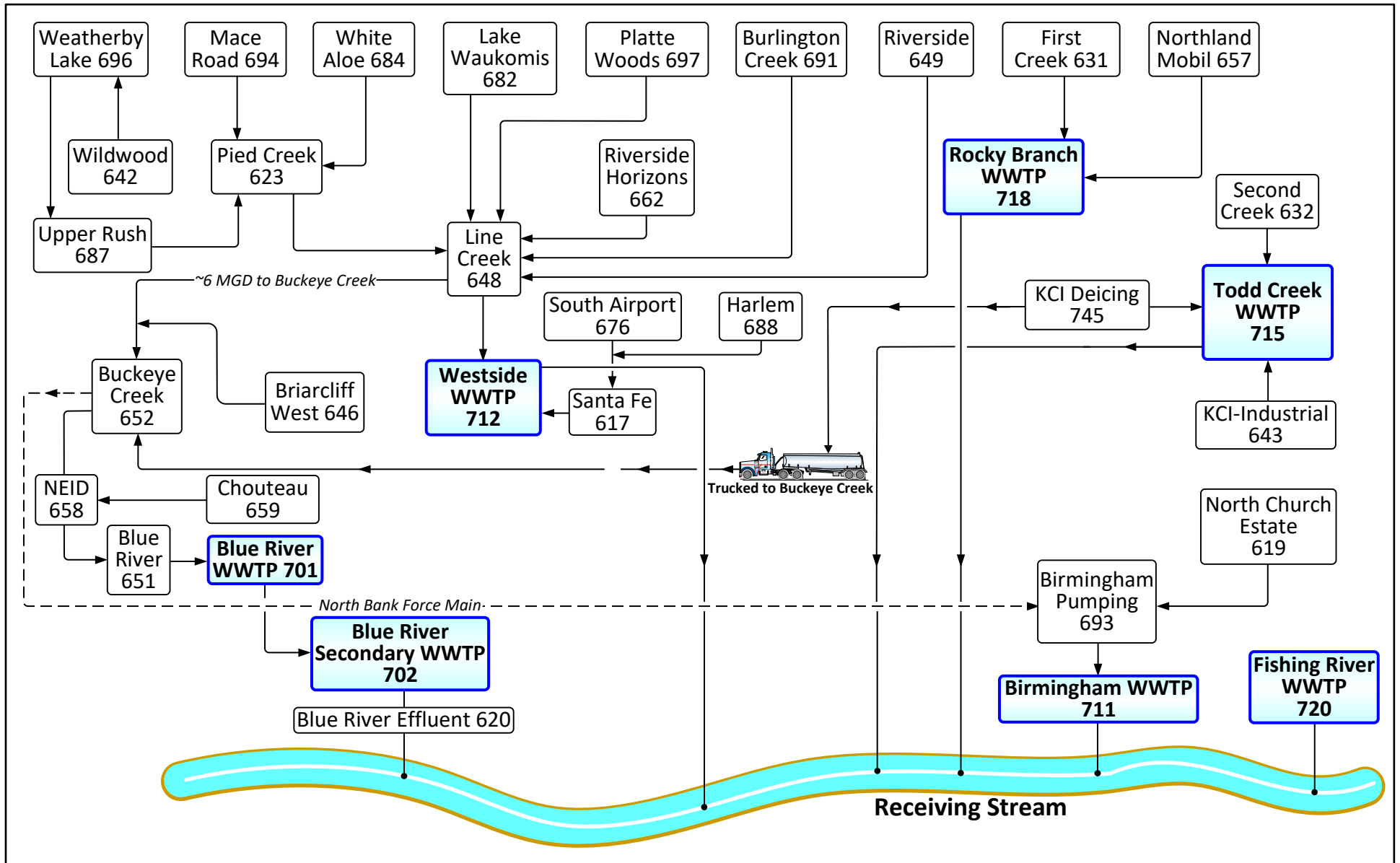
DATE _____

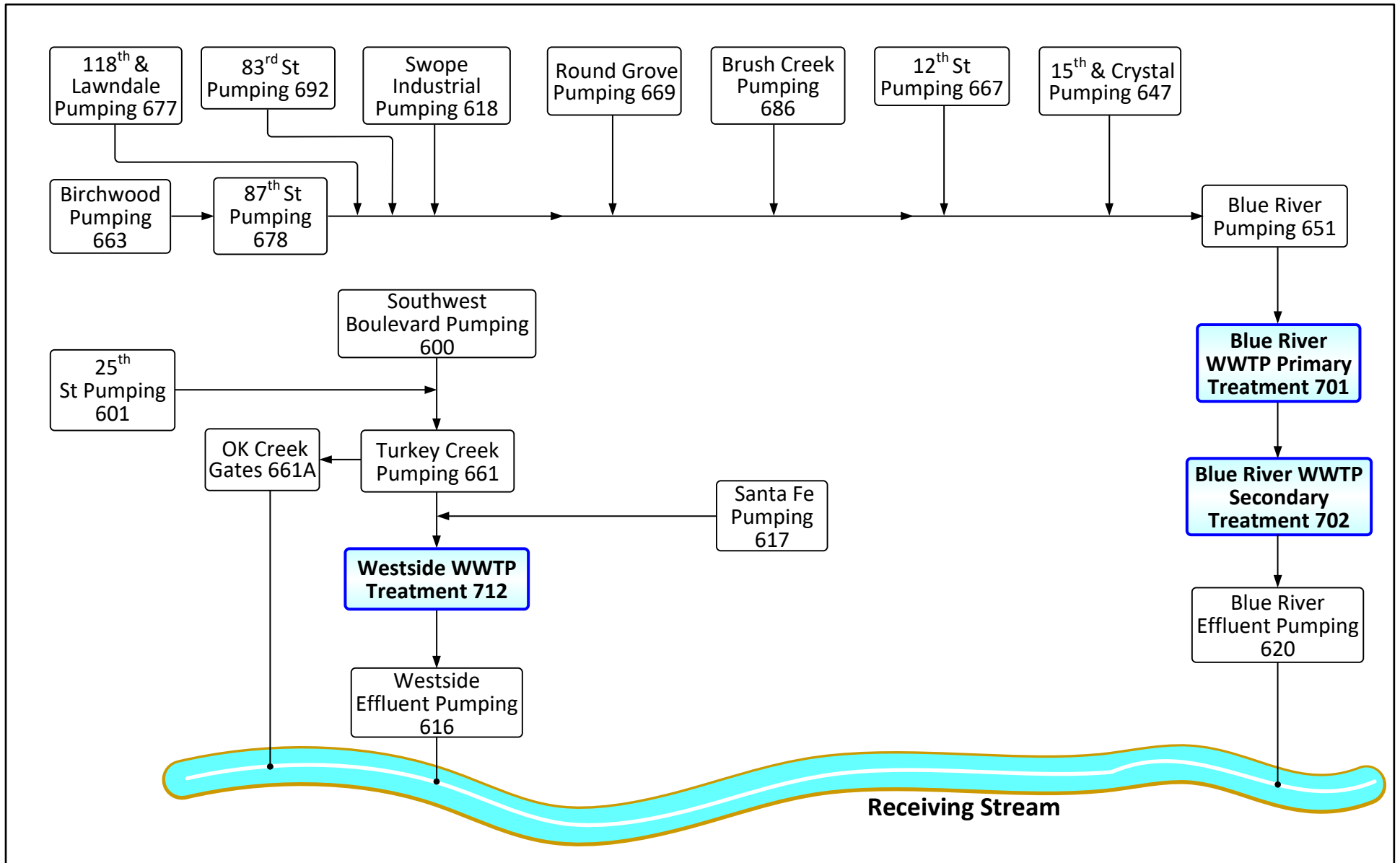
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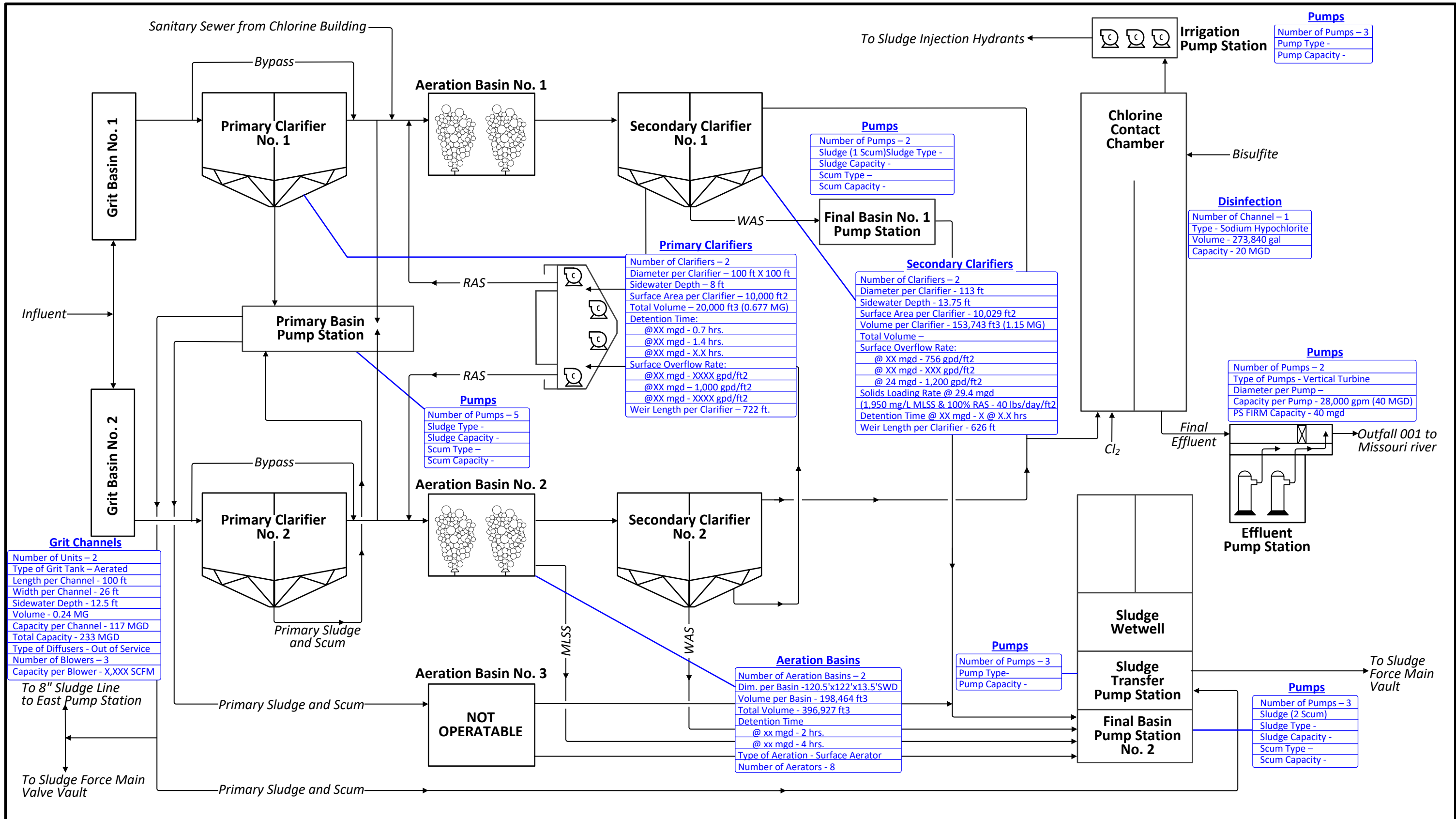
PART 3 – EXECUTION

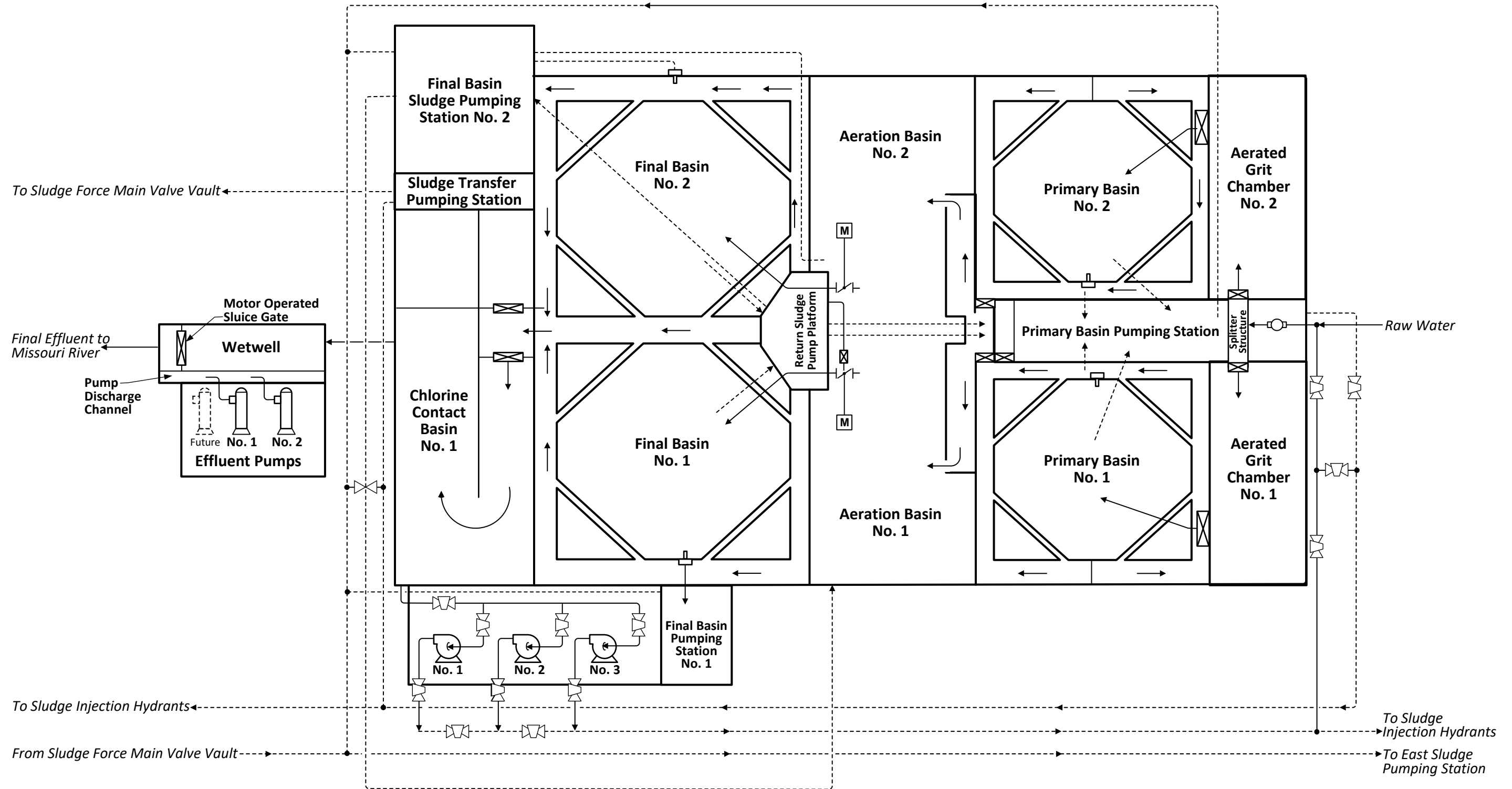
3.01 NOT USED.

END OF APPENDIX B









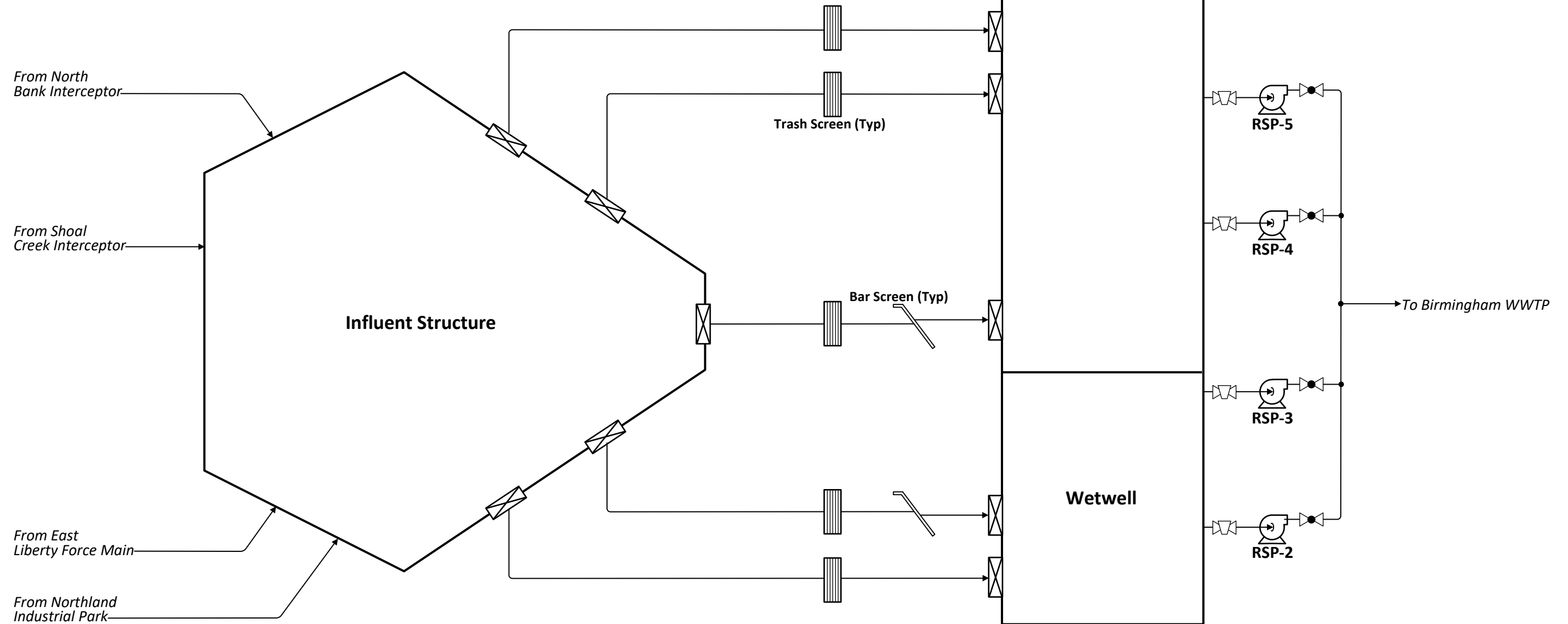
KANSAS CITY WATER SERVICES
WASTEWATER TREATMENT PLANT OPERATIONS AND MAINTENANCE

**BIRMINGHAM WWTW
WWTP OVERVIEW**

Operations
Technology Group
BV Project No: 404617
Drawn By: ADI 8-21-20
Reference: J. L.
Revised By: _____

Influent Pump Station	
No. of Units:	4
Capacity:	-
Backup:	0
Installed Spares:	0
Type:	Dry-Pit Centrifugal
Capacity:	12,500/9,500 gpm
Rated Total Head:	50 ft
Drive Type:	Constant/VFD
Flow Meter Type:	-

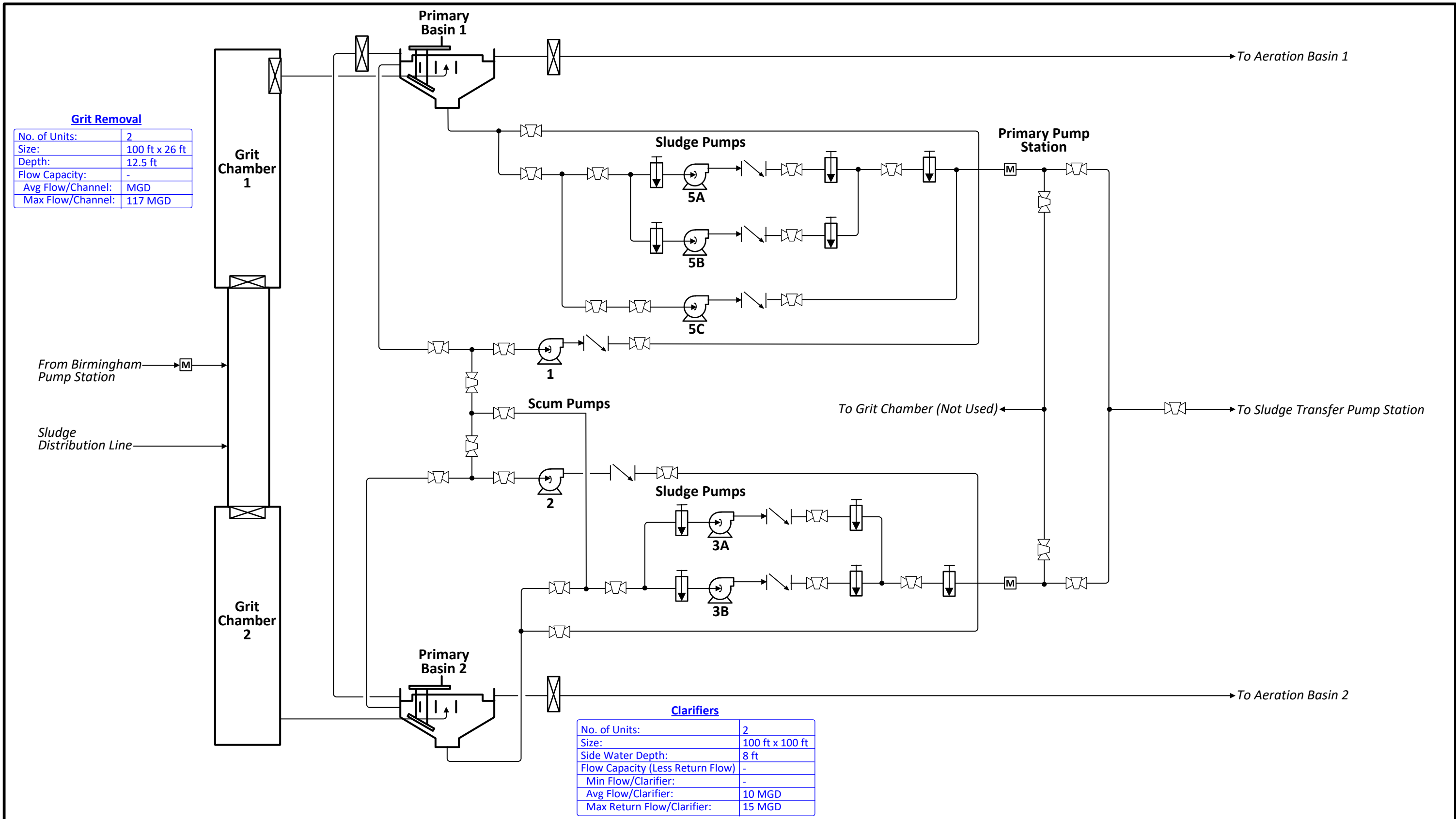
Screening	
No. of Units:	2
Type:	Mech Bar Screen
Width:	ft
Depth:	Ft
Flow Capacity:	-
Avg Flow/Channel:	MGD
Max Flow/Channel:	MGD
Wet Screenings Capacity:	MGD
Volume Reduction:	Cu ft/hr/Channel
Solids Content Compacted Screenings:	% Minimum
Material Density Compacted Screenings:	Lb/cu ft



KANSAS CITY WATER SERVICES
WASTEWATER TREATMENT PLANT OPERATIONS AND MAINTENANCE

**BIRMINGHAM WWTP
INFLUENT PUMPING STATION PROCESS FLOW DIAGRAM**

Operations
Technology Group
BV Project No: 404617
Drawn By: ADI 8-21-20
Reference: J. L.
Revised By: _____



Grit Removal

No. of Units:	2
Size:	100 ft x 26 ft
Depth:	12.5 ft
Flow Capacity:	-
Avg Flow/Channel:	MGD
Max Flow/Channel:	117 MGD

Clarifiers

No. of Units:	2
Size:	100 ft x 100 ft
Side Water Depth:	8 ft
Flow Capacity (Less Return Flow):	-
Min Flow/Clarifier:	-
Avg Flow/Clarifier:	10 MGD
Max Return Flow/Clarifier:	15 MGD

BLACK & VEATCH



KANSAS CITY WATER SERVICES
WASTEWATER TREATMENT PLANT OPERATIONS AND MAINTENANCE

BIRMINGHAM WWTP
PRELIMINARY/PRIMARY TREATMENT PROCESS FLOW DIAGRAM

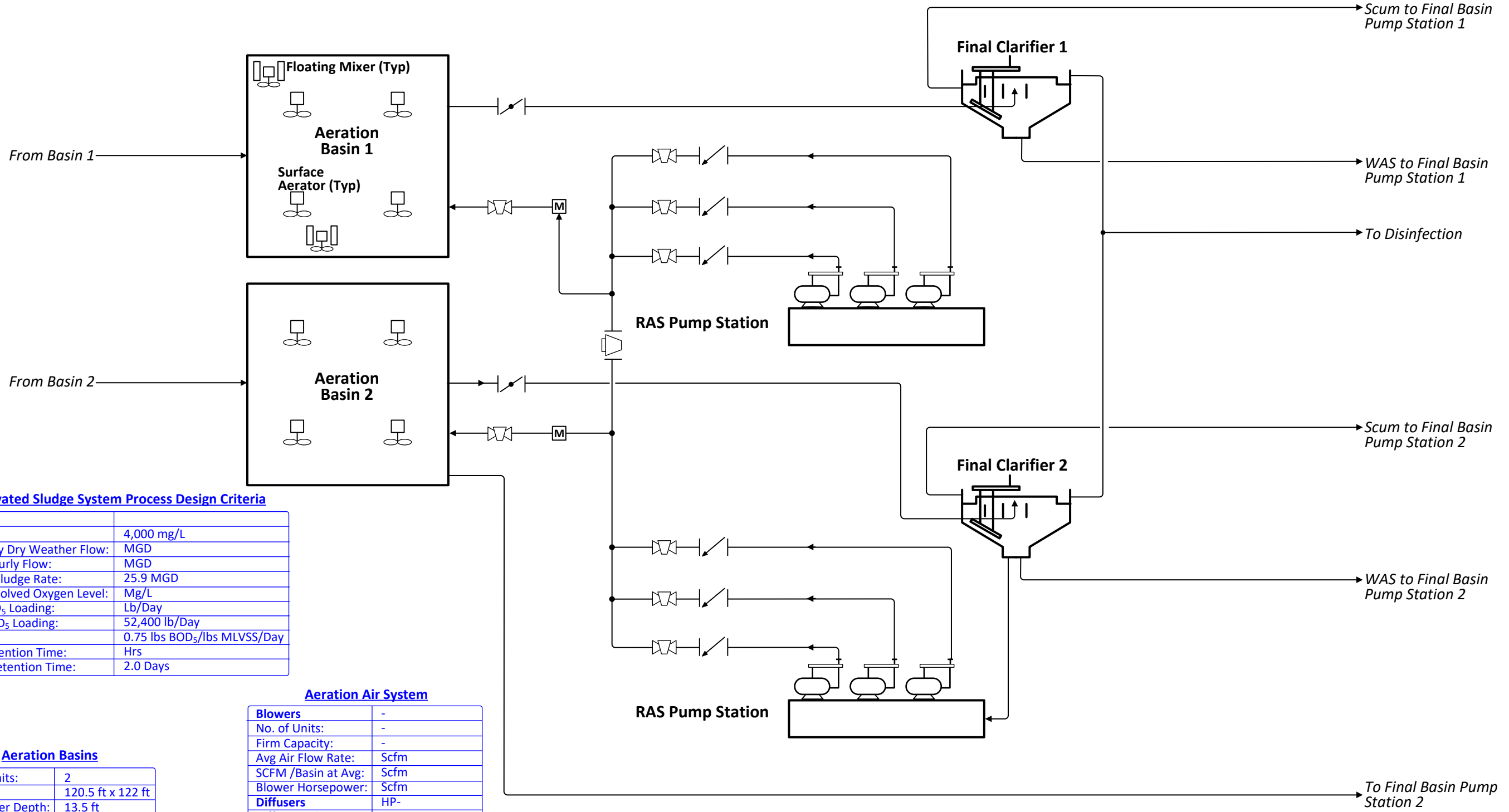
*Operations
Technology Group*

BV Project No: 404617

Drawn By: ADI 8-25-20

Reference: J. L.

Revised By: _____



Activated Sludge System Process Design Criteria

Type:	
MLSS:	4,000 mg/L
Avg Daily Dry Weather Flow:	MGD
Peak Hourly Flow:	MGD
Return Sludge Rate:	25.9 MGD
Min Dissolved Oxygen Level:	Mg/L
Avg BOD ₅ Loading:	Lb/Day
Max BOD ₅ Loading:	52,400 lb/Day
F M	0.75 lbs BOD ₅ /lbs MLVSS/Day
Min Detention Time:	Hrs
Solids Retention Time:	2.0 Days

Aeration Air System

Blowers	-
No. of Units:	-
Firm Capacity:	-
Avg Air Flow Rate:	Scfm
SCFM /Basin at Avg:	Scfm
Blower Horsepower:	Scfm
Diffusers	HP-
Diffuser Tubes:	-
Type:	Surface Aeration:
Mixer	-
No. of Units:	2
Horsepower:	HP
Type:	Floating Mixer

Aeration Basins

No. of Units:	2
Size:	120.5 ft x 122 ft
Side Water Depth:	13.5 ft
Volume/Basin:	198,464 cu ft
Total Volume:	396,927 cu ft



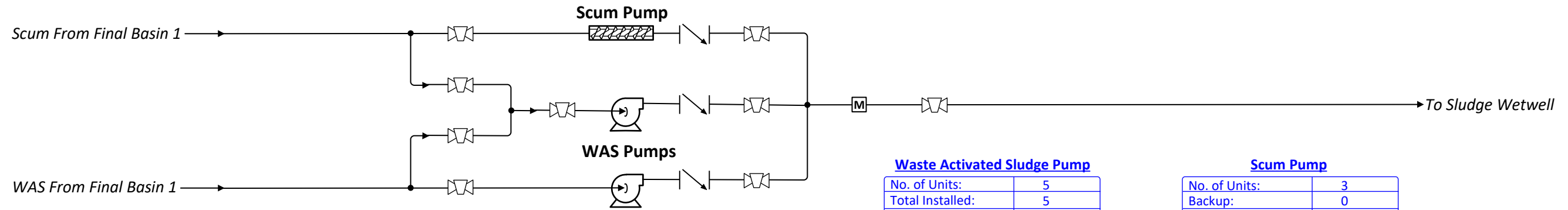
KANSAS CITY WATER SERVICES
WASTEWATER TREATMENT PLANT OPERATIONS AND MAINTENANCE

BIRMINGHAM WWTP
SECONDARY TREATMENT PROCESS FLOW DIAGRAM

Operations
Technology Group

BV Project No: 404617
Drawn By: ADI 8-25-20
Reference: J. L.
Revised By: _____

Final Basin Pump Station No. 1

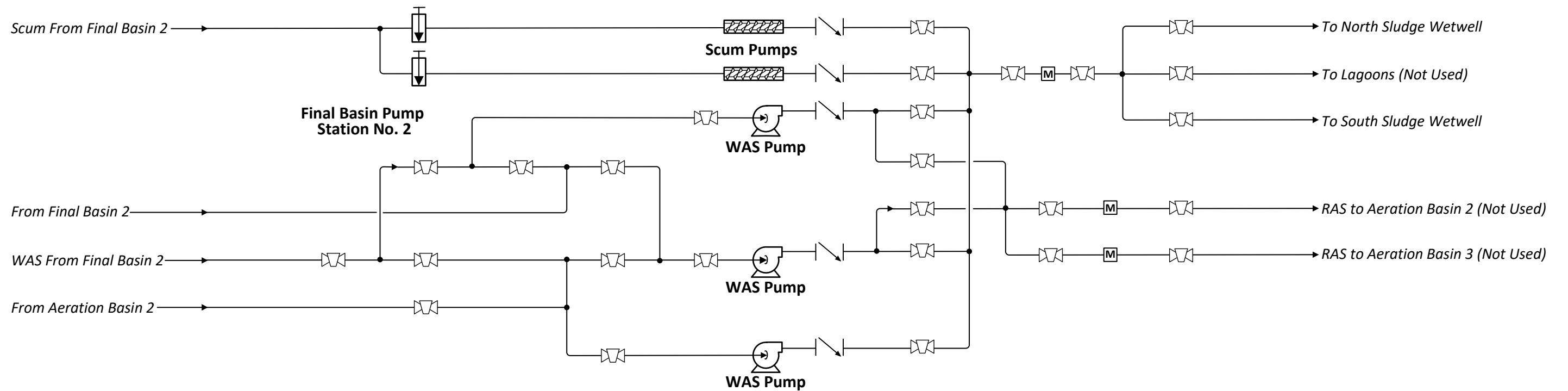


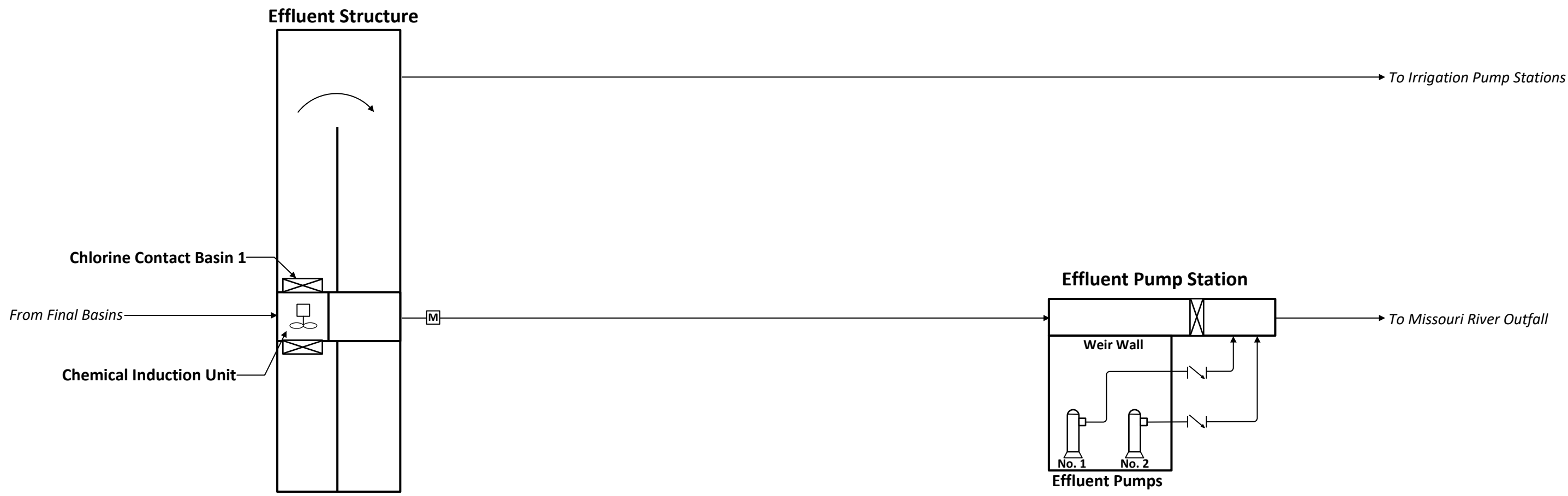
Waste Activated Sludge Pump

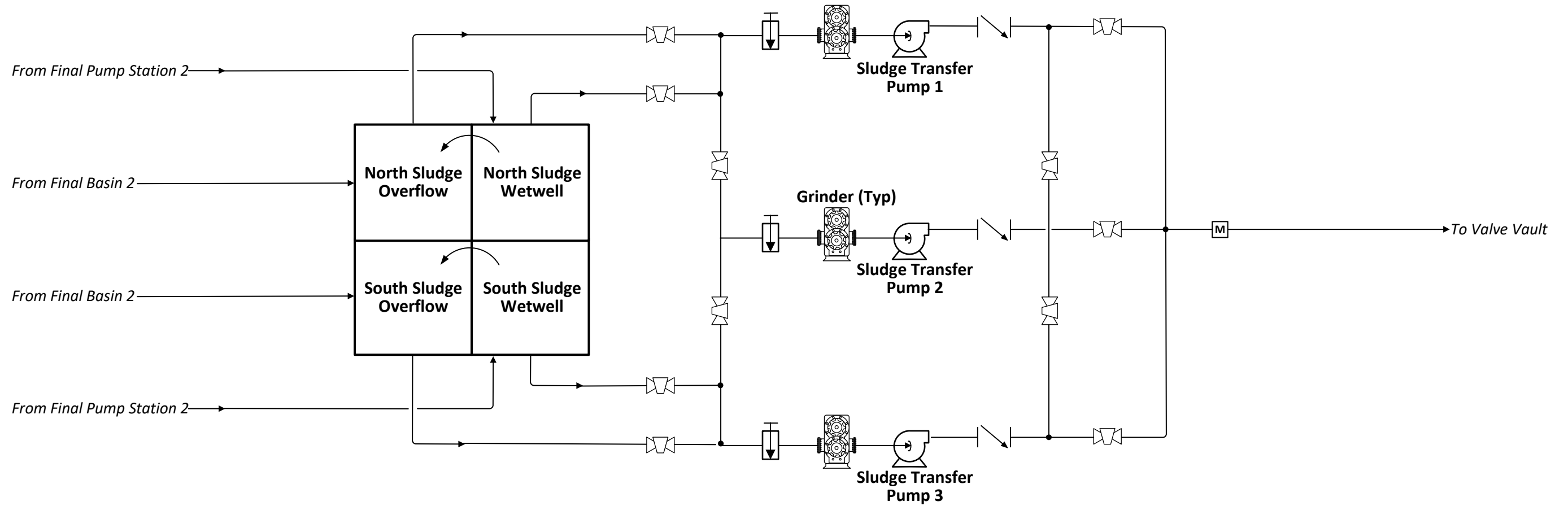
No. of Units:	5
Total Installed:	5
Uninstalled Spares:	0
Capacity:	-
Total Dynamic Head:	gpm
Motor:	Ft
Flow Meter Type:	HP
	-

Scum Pump

No. of Units:	3
Backup:	0
Uninstalled Spares:	0
Type:	-
Flow:	gpm
Total Dynamic Head:	ft
Max Horsepower:	HP
Drive Type:	-
Telescoping Valves:	-



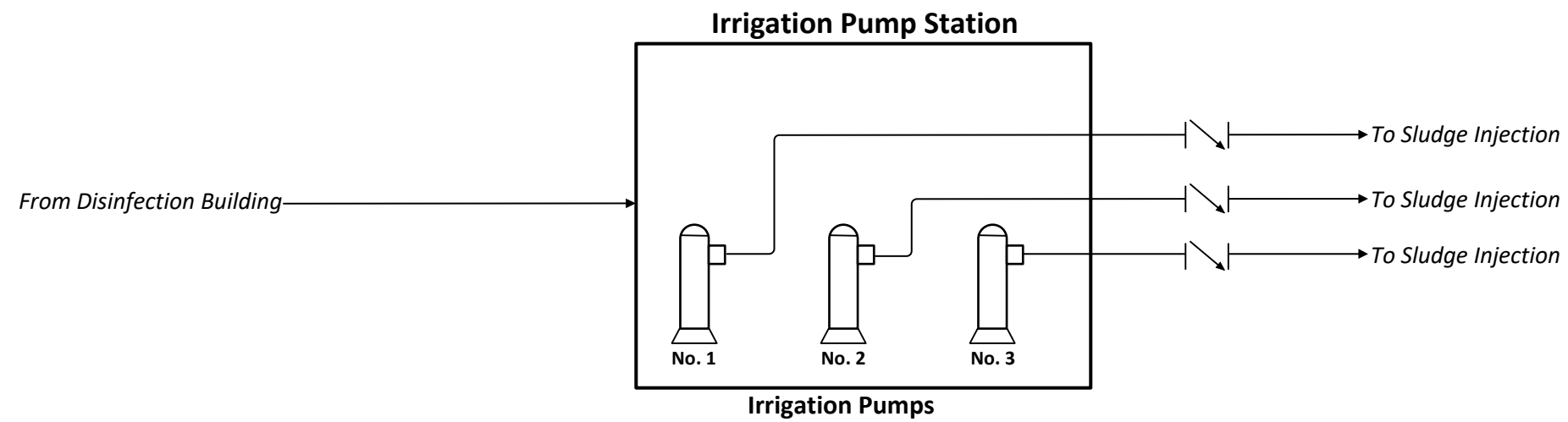




KANSAS CITY WATER SERVICES
 WASTEWATER TREATMENT PLANT OPERATIONS AND MAINTENANCE

**BIRMINGHAM WWTP
 SLUDGE TRANSFER PROCESS FLOW DIAGRAM**

*Operations
 Technology Group*
 BV Project No: 404617
 Drawn By: ADI 8-26-20
 Reference: J. L.
 Revised By: _____



SECTION 13510 – COMPUTER SYSTEM HARDWARE

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers the furnishing and installation of standard computer system hardware fully configured to work with the software specified in the computer system software section. Principal items of the computer and peripheral hardware to be furnished are specified or are indicated on the control system block diagram on the Drawings.
- B. System Supplier shall furnish all necessary interconnecting cables, accessories, and appurtenances as well as additional computer or peripheral hardware required for proper operation and to meet the functional requirements indicated on the Drawings and specified herein.
- C. All equipment shall be capable of tolerating and "riding through" a power interruption of 8 milliseconds or less without interruption of normal operation.
- D. Control System
 - 1. Section Instrumentation and Control System shall apply to all computer hardware furnished under this section.
- E. Refer to Appendix 13510-A Standard Computer Configurations for a listing of computer hardware requirements covering devices specified herein.

1.02 GENERAL

- A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
- B. General Equipment Stipulations
 - 1. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.03 SUBMITTALS

- A. See Section 13500 - Instrumentation and Control System
 - 1. Submittals shall be as specified in the Instrumentation and Control System section.

1.04 DELIVERY, STORAGE, AND SHIPPING

- A. Delivery, storage, and shipping shall be as specified in the Instrumentation and Control System section.

PART 2 – PRODUCTS

2.01 SYSTEM COMPUTERS

- A. Server Computers
 - 1. System Supplier shall ensure that all computers are configured to operate properly with all software, input/output devices, and peripherals supplied.
 - 2. Each server provided shall be configured identically to allow them to be used interchangeably between applications. Each server shall be the model and configuration as listed in the appendix to this section.
- B. Engineering Workstation Computers
 - 1. Each engineering workstation computer shall be comprised of the configuration listed in the appendix to this section.
 - 2. CD-RW/DVD Drive Compatibility
 - a. The workstations shall be supplied with front-access USB ports capable of being configured for the use of an external CD-RW/DVD drive.
- C. Thin Clients
 - 1. Each thin client shall be comprised of the configuration listed in the appendix to this section.
- D. Portable Laptop Computer
 - 1. One portable laptop computer shall be provided. The configuration listed in the appendix to this section shall be provided as a minimum.

2.02 MONITORS

- A. Each server shall be provided with a single monitor in the size indicated in the appendix to this section. Each engineering workstation computer and thin client shall be provided with dual monitors in the size indicated in appendix to this section.
- B. Monitors shall meet the requirements listed in the appendix to this section.

2.03 BADGE SCANNERS

- A. Each Engineering Workstation and Thin Client shall be provided with an RFID badge scanner. The badge scanner shall be configured to allow an operator to log onto the workstation or thin client by swiping their Owner-provided RFID. User verification shall be manufactured by RF Ideas Model RDR-80581AKU-RA, without exception to match existing units.

PART 3 – EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Installation, field check, testing and training shall be as described in the Instrumentation and Control System section.

END OF SECTION

13510 –Computer System Hardware

APPENDIX 13510 – STANDARD COMPUTER CONFIGURATIONS

PART 1 – GENERAL

1.01 SUMMARY

- A. This appendix includes the Owner’s standard computer configurations and hardware requirements.

PART 2 – PRODUCTS

2.01 SERVER COMPUTERS

Server:	Stratus fitServer 4920 for SCADA server applications. Hewlett Packard (HP) servers for high level historical, reporting, and virus detection functions.
CPU:	Dual Intel Xeon with 10 Hyperthreaded cores per processor
Memory Size (RAM):	128GB
Storage:	2.44TB combined utilizing 600 GB 15K RPM 2.5” disk drives
Monitor Size:	24” diagonally
Other Requirements:	<ul style="list-style-type: none">• 23 GHZ Auto Uptime Layer for VM• Configuration of 23 Virtual Machines• US/JP 115-15A NEMA 5-15P• Stratus Total Assurance• 5 year Warranty and Support with Active Remote Fault Notification

2.02 ENGINEERING WORKSTATION COMPUTERS

CPU Type:	Intel Core i7
CPU Speed:	3.4 GHz
Memory Size (RAM):	16GB minimum
Monitor Resolution:	Ultra-high 4K 3840 x 2160
Monitor Type	IPS type LCD panel or approved equal
Monitor Size	24” diagonally
Manufacturer:	Hewlett Packard (HP)
Other Requirements:	<ul style="list-style-type: none"> • 512 GB solid state drive (SSD) • Single CPU • CD/DVD Reader-Writer • Integrated or discrete graphics processor unit (6GB VRAM dedicated) • 12 MB cache • One 10/100/1000 Mbps RJ-45 connectivity Ethernet port • Wired scroll mouse • Standard wired Windows keyboard • Minimum of 6 USB 3.1 Gen 1 type A ports • Minimum of 2 USB Type C ports • Integrated sound card and speakers • 3.5mm audio port

2.03 THIN CLIENTS

Display outputs:	Capable of supporting multiple display port and/or multiple HDMI ports.
Monitor Resolution:	Ultra-high 4K 3840 x 2160
Monitor Type:	IPS type LCD panel or approved equal
Monitor Size:	24” diagonally
Memory Size (RAM):	4GB
CPU:	Intel Atom Quad Core or approved equal
Storage:	128gb SSD
Other Requirements:	<ul style="list-style-type: none"> • One 10/100/1000 Mbps RJ-45 connectivity Ethernet port. • Fanless thermal solution. • Mounting options for wall, VESA, DIN rail, bookshelf, and machine mount. • -20 to 60 deg C operating temperature.
Manufacturer:	Rockwell Automation Versaview 5200 Non-Display Thin Client or approved equal.

13510-A – Standard Computer Configurations

2.04 PORTABLE LAPTOP COMPUTER

CPU Type:	Intel Core i7
CPU Speed:	3 GHz
Display Resolution:	FHD 1080p
Display Type:	TFT Flat Panel LCD with 300 nits brightness
Display Size:	14" diagonally
Memory Size (RAM):	16GB
Storage:	512GB SSD
Other Requirements:	<ul style="list-style-type: none"> • One 10/100/1000 Mbps RJ-45 connectivity Ethernet port • HDMI video output • Minimum of 2 USB 3.1 Gen 1 type A ports • Minimum of 2 USB Type C Thunderbolt 4.0 ports with Power Delivery and DisplayPort • Intel integrated graphics • Integrated sound with speakers • 3.5mm audio port • Lithium-ion battery with a minimum of 5 hours of use. • Windows 10 Operating System
Docking station shall be provided with the following requirements:	<ul style="list-style-type: none"> • Integral 10/100/1000 Base-TX Ethernet connection • USB C laptop connection • Minimum of 2 USB Type C ports • Minimum of 3 USB 3.1 Gen 1 type A ports • HDMI video output and two DisplayPort video outputs • 3.5mm audio port • Kensington security slot • Standard windows keyboard • Standard scrolling mouse
Manufacturer:	Dell Latitude or approved equal

2.05 MONITORS

Display Type:	IPS LED-backlit LCD with antiglare finish
Display Resolution:	Ultra-high definition (UHD) 4K 3840 x 2160
Display Refresh Rate:	60Hz
Brightness:	350 cd/m ² .
Aspect Ratio:	16:9
Contrast Ratio:	1000:1

13510-A – Standard Computer Configurations

Connectivity:	Display Port and HDMI port integral to the unit.
Additional Requirements:	<ul style="list-style-type: none"> • Removable height-adjustable stand for setting on a desk. • VESA mount compatible.
Requirements for Large Screen Monitors:	<ul style="list-style-type: none"> • 70-inch diagonal screen size • 120 Hz refresh rate • Commercial rated and designed for continuous 24/7/365 operation.
Manufacturers:	Samsung, LG, or Sony.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 13520 – COMPUTER SYSTEM SOFTWARE

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers computer system software to be furnished and installed by the System Supplier on computer hardware specified in the respective Division 13 sections.
- B. System Supplier shall furnish standard, field proven, fully debugged and supported software packages for this application with a minimum of additions or changes. Customized or specially written software shall be furnished only if required to meet all functional requirements specified herein.
- C. Software is described in functional categories. System Supplier shall furnish a complete software package including the functional requirements specified, along with any additional software required for proper and efficient operation of the system. Rockwell Automation software shall be purchased from Rensenhouse Electric Supply KCMO as indicated in the Bid Form and Allowances sections and as specified herein.
- D. This section includes general requirements and may not list all software or all characteristic of software required by System Supplier to meet the functional requirements specified, nor to determine the location of the software modules within the system.
- E. The computer control software shall meet the design conditions and performance requirements.
- F. Control System
 - 1. The Instrumentation and Control System section shall apply to all software furnished under this section. Additional software requirements are indicated in the Software Control Block Descriptions section. Software configuration programming standards shall be as discussed in the Instrumentation and Control System section.

1.02 GENERAL

- A. Software packages shall control computer system level activities as well as higher level process control activities, allowing the process to be monitored and controlled through an interactive operator interface.
- B. Interface
 - 1. Users shall be able to interface to all process control activities through fully interactive software modules initiated and operated using easily recognized icons or custom symbols or driven by full-screen and pull-down menus. Selection of icons or menus shall be through pointing devices and shall not normally require the use of an alphanumeric keyboard. Systems that require the use of typed commands to move from module to module or from display to display are not acceptable.

- C. Execution
 - 1. Throughout the execution of all software modules, the operator shall be presented with all command or operation choices available at that point in the program to make the choices self-explanatory and unambiguous. Question-and-answer or fill-in-the-blank requests are acceptable only where file names, tag names, or other unique text or numerical information is required.
- D. Configuration
 - 1. All programs shall be self-configuring to obtain the size and configuration of the system from parameters contained in the various files created during system generation. No parameters related to the hardware configuration shall be hard coded into any of the software.
- E. Version
 - 1. All programs shall be the latest version commercially available at the time the system is delivered to the Owner. Superseded versions, revisions, or releases are not acceptable
- F. Drawings
 - 1. Supplementing this section, the Drawings indicate locations and arrangement of computer enclosures and provide one-line and block diagrams regarding the connection and interaction with other equipment.

1.03 SUBMITTALS

- A. See section 13500 – Instrumentation and Control System
 - 1. Submittals shall be as specified in the Instrumentation and Control System section.
- B. Software Module Descriptions
 - 1. In addition to the requirements of the Instrumentation and Control System Section, a complete description of the software packages and modules shall be submitted to verify compliance with this section.

1.04 DELIVERY AND SHIPPING

- A. Delivery and shipping shall be as in the Instrumentation and Control System section.

PART 2 – PRODUCTS

2.01 OPERATING SYSTEM SOFTWARE

- A. Server operating system software shall be Windows Server 2016, without exception, and shall include a complete and unmodified operating system that provides system level functions. Workstation and thin client operating system shall be Windows 10, without exception.

2.02 PROCESS CONTROL SYSTEM APPLICATION SOFTWARE

- A. Process control software shall enable the operator to monitor and control field devices connected to PLCs, RTUs, or other input/output hardware. The process

control system application software shall meet the following minimum requirements and shall exceed these requirements where necessary to comply with the functional requirements of the project. A license shall be issued for each machine loaded with process control software.

- B. A license shall be issued for each machine loaded with process control software.
- C. Approved Software
 - 1. The process control system application software shall be Rockwell Automation FactoryTalk SE with PlantPAX, without exception.
 - 2. The control system hardware shall be as specified in the Computer System Hardware section.
 - 3. Required Software Modules
 - a. The following software modules shall be provided, installed, and configured by the System Supplier.

Software	Description	License by Rensenhouse Electric (RE) or Re-Used (RU)
Process Automation System Server (PASS)	Consists of the following modules: <ul style="list-style-type: none"> • FactoryTalk View SE Server (10 client licenses for new package) • FactoryTalk Linx • Alarm Management • FactoryTalk Historian Interface 	RE
Active Directory (replicate)	Manages security authentication using a database within the Windows server domain.	RU
Remote Desktop Server/Thin Manager (RDS/TM)	Consists of the following modules (client licenses in parentheses): <ul style="list-style-type: none"> • FactoryTalk SE Client Thin Manager • FactoryTalk SE Client RDS Client • Access Licensing 	RE

4. Additional requirements for the SCADA System software capabilities and programming are provided in associated Division 13 sections.
- D. Password Protection
1. Operator access within the control system software shall be controllable through a password-based security scheme. Operators shall be assigned their own user account and password. Nine levels of security protection shall be provided. Each system display, database block, control action, and software module shall be assigned its own security levels and shall be inaccessible to users without proper security clearance. After initial creation, passwords shall be field alterable, but only by the assigned user or a system administrator.
- E. System Response
1. All responses to the operator shall be clear, unambiguous, and complete. Every operator menu, target selection, or request shall generate a response providing the range of choices for the next step in the process or indicating that the request or chosen operation has been completed, is being processed, or cannot be performed. Every operator menu or target pick shall generate a graphic or text message response, even if it is a negative one.
- F. Interactive Software Commands
1. The software's interactive command structures, user interface, menu organization, and procedures shall be consistent and predictable for all software modules throughout the system. Similar operations shall be performed in a similar manner, so that an operator will not need to learn different techniques for initiating the same operation in different software modules.
- G. Operator Commands
- a. The software shall accept each operator command or selection, decode it, and check its validity and correctness in the sequence of data and operations previously presented. Invalid or incorrect commands or menu selections shall not be processed; instead, a message shall be generated which explains why the command or menu selection is invalid. When a command or selection is canceled prior to being fully processed, the software shall clear all pending sequences and shall not initiate any system control commands.
- H. Database
1. The software shall include a comprehensive interactive database system for creating, sorting, editing, and monitoring all process inputs and outputs and internally used variables and control blocks. The system shall request, receive, process, and store all real-time data according to the information contained in the database. Database points shall be enabled or disabled individually at any time by an operator working at the proper security level. All internal database

point information shall be accessible to other external database software applications through ODBC export of comma separated value direct SQL commands.

I. Alarm Processing

1. Alarm processing software shall be provided to recognize and report alarms to the operator in an organized, unambiguous, clear, and convenient manner. Alarms shall be classified into at least five priority levels and at least two independent classes. System events shall be considered alarms classified by their own specific priority or class.

a. Alarms

(i) Alarm processing software shall generate alarms for at least the following conditions.

1. Discrete input or output change of state if defined as an alarm in the database.
2. Analog value exceeding the alarm limits defined in the database.
3. Analog rate of change exceeding the limits defined in the database.
4. Failure of any process input/output hardware, communications link, or other major hardware component.

b. Acknowledgement

(i) Alarms shall be generated as they occur and shall not be cleared until they have been acknowledged and conditions have returned to normal. Alarms shall clear from each operator workstation once they have been acknowledged from any workstation.

c. Alarm Summary Display

(i) An alarm summary display shall be provided which lists at least 100 of the most recent alarms in all classes, with the most recent alarm listed first. Alarms shall appear flashing or in a unique color until they are acknowledged by the operator. Alarms of different priorities shall be easily distinguished on all alarm displays through the use of unique colors or similar methods.

(ii) Each operator workstation in the system shall be configured to display only certain alarms, alarm classes, and alarm priorities based on the preferences of the Owner.

d. Alarm Logging

(i) Alarm logs shall constitute a hard-copy record and a soft-copy record saved in the historical database of all alarms, events, and significant operator actions. Alarm displays and alarm log entries shall include the date and time that the alarm was detected, the tag name and description of the alarmed point, and an entry describing the nature of the alarm. Alarms shall be logged on an alarm and event printer and saved in the historical database as they occur.

e. Responses to Alarms

- (i) An audible alarm shall sound at the operator's console at each occurrence of a new alarm event. The audible alarm shall be silenced when it is acknowledged by the operator.
 - (ii) Voice annunciation shall be used to annunciate alarm events.
 - (iii) The audible alarm shall use an external sound system, such as a sound card and external speakers.
 - f. Alarm Enabling
 - (i) Alarms originating from database entries such as discrete change of state or analog limit violations shall be enabled or disabled on a point-by-point basis.
 - (ii) Alarms shall be capable of being shelved for an operator-entered period of time. After the alarm shelving time period has elapsed, the shelved alarm shall become active again.
 - g. Alarm Notification Software
 - (i) Alarms shall be integrated into the Owner's existing external or integral alarm notification software package to generate alarms for paging, texting, voice call, or email systems.
- J. Operator Interface
 - 1. System software shall be suitable for creation and modification of alphanumeric and graphic displays and linking of dynamic fields to database variables.
- K. System Storage
 - 1. The system shall be capable of storing and utilizing full-screen user displays and pop-up windows, each containing any number of the following components:
 - a. Static and dynamic alphanumeric information.
 - b. Static and dynamic or object-based graphics.
 - c. Dynamic bar graph displays.
 - d. Dynamic analog real-time and historical trends displays.
- L. Component and Configuration Information
 - 1. The software shall enable the user to reuse components and configuration information from any screen or pop-up window with or without modification. All configuration information shall be displayed in any of 256 colors, flashing or non-flashing. Dynamic fields shall change color or from flashing to non-flashing and back in response to a change in value, state, or alarm condition of the linked variable. Dynamic objects linked to process inputs and outputs shall be capable of displaying at least three equipment states, such as on/off/alarm for pumps, or open/close/transition for valves.
- M. Communications
 - 1. System software shall support communications among computers and PLCs as indicated on the Drawings and as specified herein. System Supplier shall be

responsible for any device driver development required to support the communications indicated.

2. Data Retrieval and Transmission

a. The software shall retrieve and send data from and to all remote field devices indicated on the Drawings. The software shall perform all required error checking to ensure the validity of all data transactions and proper completion of the scan sequence. All communication system malfunctions, including "no response", shall be reported to the system as alarms. Re-transmission shall be utilized to correct or overcome communication errors.

3. Communications Driver

- a. The software shall be supplied with communications drivers capable of communicating with any existing remote field devices indicated on the Drawings as well as all software input/output drivers required to communicate with all field devices and system hardware that are furnished as part of the control system.
- b. Network communications drivers shall be provided for notification and alarming of SNMP compliant devices, such switches and routers. Drivers shall be OPC to SNMP drivers. Generic OPC drivers shall be provided for the HMI software as required. Drivers shall be Kepware, Matrikon, or equal.

N. Historical Data Storage

1. The software shall include modules for historical data gathering, data reduction, and reporting. Real-time analog signal values shall be collected and stored in the historical database based on a user defined time interval of 1 second to 1 day, or on a change of state deadband configured for each database point. Alarms and events shall be collected and stored in the historical database as they occur. The historian shall support the following features:

- a. The historical database shall be a real-time relational database. The database shall be an extension of Microsoft SQL Server. The historical database shall acquire point information from the graphical user database.
- b. Access to data shall be by any SQL or ODBC compliant software package, such as Crystal Reports, Oracle database applications, Microsoft Excel, or Microsoft Access.
- c. Database shall allow the use of a separate I/O server for data from the programmable logic controller system.

2. Data Reduction Capabilities

a. Data reduction capabilities shall be provided to average and reduce data to hourly records, and the hourly records to daily records. Entries for all hourly and daily averaged records shall include sample, average,

minimum and maximum values as defined by Owner. Both hourly and daily averages for each day shall be stored in the historical database.

3. Retrieval Software

a. Data retrieval software shall be provided to allow access to historical data files for the following uses:

(i) Tools shall be provided for remote trending and display of the data on all user workstations. Trend displays shall allow up to eight tags to be graphed in the window. Graphs shall allow stacking or separate display of each tag. Displays shall allow save functions for retrieval from the computer hard drive. Trends shall display real-time data, or display data from the history files. The trend display shall show the time frame of stored data.

(ii) Import/export of data from/to ASCII files.

(iii) Inclusion in user-generated reports.

(iv) Tools for Microsoft Excel display of data shall be included. Tools shall allow the retrieval and display of real-time data, or historical data.

O. Reports

1. Report logs shall constitute a hard-copy summary of user-selected process data. At least 30 report formats shall be available in the system. Report printing software shall include a user-interactive, on-line report editor to allow the operator to select the following parameters for each report:

a. Data consisting of measured variables, calculated variables, and manually entered data.

b. Starting and ending time of data to be included in the report.

c. Print format for each variable.

d. Titles and subtitles to appear on each page of the report, including report name, current time, and date.

e. Paper width (from 8 to 14 inches).

f. Print pitch (from 5 to 16.5 characters per inch).

g. Number of columns on each page.

h. Number of lines per page and number of pages per report.

2. Database Points

a. All database points in the system, including all input/output points, manually entered points, and calculated points, shall be available for use in reports. Reports shall include sample, average, minimum, and maximum values for analog variables and the time of occurrence for minimum and maximum values. Information printable for discrete variables shall include running time, state, and transition count.

3. Report Formats

a. Report logs shall constitute a file or a hard-copy summary of user-selected process data. All historical data for points in the history database shall be

available for reporting from an SQL and ODBC compliant database. Reporting software shall have the following features:

- (i) Creation and modification of report formats or content shall not require direct modification of system source code. Reports shall have the ability to be created in third party software packages such as Microsoft Excel and Microsoft Access.

P. Off-line Storage Software

1. The software shall include provisions for copying to backup media any or all of the historical data currently stored on the hard drive. The software shall support archival of data to any backup devices specified in the Computer System Hardware section. Archival of data shall be intuitive and the archival software shall guide an operator through the backup process.
2. Backup Data
 - a. Once historical data is copied to back-up media, the software shall allow the operator to delete it without negative consequences to free space on the hard drive. Archived historical data shall be re-loadable and usable in all the same ways as historical data that has not been removed from the local hard drive.
3. Logical Disk Drive
 - a. If the backup device is on-line and addressable by a logical disk drive letter (e.g., an optical disk drive defined as "D:"), historical data archived to that device shall be accessible directly without restoration to a local hard drive.
4. Internet/Intranet Connectivity
 - a. The software shall include provisions for making connections to the process data through the existing corporate Intranet or through a connection made on the Internet. This "thin client" solution shall provide authorized users access to all displays and process information by utilizing any standard Internet browser.
 - b. The application software shall include software for development for web browser based interface. Features shall include the following:
 - (i) The software shall allow access to the real-time process operations through any web browser without special software on the computer.
 - (ii) The software shall provide security to prevent unauthorized use.
 - (iii) The software shall allow the user to view alarms through the browser.
 - (iv) The software shall allow the user to view historical data through the browser.

2.03 SOFTWARE DOCUMENTATION

- A. System Supplier shall relinquish all documentation supplied with the software furnished, such as user manuals, programmer guides, reference cards or keyboard templates, and related materials. In addition, System Supplier shall generate and submit to Owner and Engineer written documentation of any configuration work,

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modifications of the system, or setup of software done before or after installation of equipment on the site. Documentation shall be electronic and one hard copy. This includes any and all information on the development of any standard “objects,” “wizards,” or “scripts” created for the use in this project.

2.04 PLC SOFTWARE

- A. The requirements for PLC software are specified in the Programmable Logic Controller section.

2.05 EXTENDED SUPPORT OR WARRANTY

- A. The process control system software shall include the extended or comprehensive support service of the manufacturer. The service shall include all software updates and phone and personal support when needed. The service shall be for a period of one year after final acceptance and shall cover all software packages supplied under this contract.

2.06 TRAINING SERVICES

- A. Training requirements are specified in the Instrumentation and Control System section.

PART 3 – EXECUTION

- A. The System Supplier shall install the process control software on the control system hardware specified in another section.
- B. Configuration
 - 1. System Supplier shall install and properly configure any supplemental programs, modules, and software packages necessary to meet the functional requirements of the project as described in the Instrumentation and Control System and Software Control Block Description sections.

END OF SECTION

SECTION 13530 – PROGRAMMABLE LOGIC CONTROLLERS

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers programmable logic controllers (PLCs), including associated input/output hardware to control process equipment and serve as the interface to field devices.
- B. Control System
 - 1. The Instrumentation and Control System section shall apply to all equipment furnished under this section. Additional PLC software requirements are indicated in Software Control Block Descriptions section.

1.02 GENERAL

- A. Equipment furnished and installed under this section shall be fabricated, assembled, erected and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
- B. General Equipment Stipulations
 - 1. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.
- C. Drawings
 - 1. Supplementing this section, the Drawings indicate the number and types of PLCs, locations of PLCs, and provide diagrams and schematics regarding connection and interaction with other equipment. All hardware, including power supplies, special cables, and other appurtenant equipment, shall be provided to meet the functional requirements described herein and indicated on the Drawings.
- D. PLC Listings
 - 1. Listings of the PLCs and OITs that are part of the project are attached as Appendix A to this section. Input and output (I/O) listings for PLCs are included on the Drawings.

1.03 SUBMITTALS

- A. See section 13500 – Instrumentation and Control System
 - 1. Submittals shall be as specified in the Instrumentation and Control System section.

1.04 DELIVERY, STORAGE, AND SHIPPING

- A. Delivery, storage and shipping shall be as specified in the Instrumentation and Control System Section.

1.05 SPARE PARTS

A. Spart Parts shall be furnished as follows:

<u>Spare Part</u>	<u>Quantity</u>
Processor modules	2 of each type
Power supply modules	2 of each type
I/O modules	3 of each type
Communication modules	3 of each type

PART 2 – PRODUCTS

2.01 GENERAL

- A. All equipment furnished under this section shall be expressly selected by System Supplier for its superior quality for the intended purpose and shall comply with the following requirements.
- B. Interchangeability
1. All programmable logic controller systems shall be products of the same manufacturer and of the same series or product line. Processors, local and remote input/output hardware, communications modules, and specialty modules such as coprocessors and ASCII modules shall be interchangeable among all I/O panels and systems. PLC modules and hardware by other manufacturers will be acceptable only if the PLC manufacturer does not offer suitable modules and hardware for the same functions.
- C. Initial, Spare, and Future Memory (RAM)
1. System Supplier shall provide adequate memory for the amount of I/O, control algorithms, and communications in the initial system.
 2. Each programmable logic controller shall include provisions for future expansion and shall have 100 percent spare memory capacity and 100 percent spare data capacity installed. The spare memory capacity shall be documented by submitting to Engineer, during factory testing, a statement indicating the amounts of memory of all types being utilized and the total amount available in each system. The statement shall include an estimate of the total program and data memory necessary, including spare memory, based on the I/O hardware for the system, and previous programming experience.
- D. Spare I/O
1. Each PLC input/output enclosure shall be provided with at least 20 percent spare inputs and outputs of each type. Spare I/O shall be installed, wired, and interfaced properly to the terminal strip. The spare I/O shall be in addition to any I/O installed and reserved for future process signals as may be indicated on the I/O list. In addition, each PLC input/output enclosure shall be capable of accommodating 20 percent of additional input/output capacity of each type

as originally assembled, without the need for additional expansion racks, communication adapters, cables, or PLC power supplies.

- E. Expandability
 - 1. Each PLC processor and associated I/O shall have a future expandability of at least 50 percent of the provided system.
 - 2. A minimum of two spare slots or 10% spare slots, whichever is greater, shall be provided between the digital cards and the analog cards to allow expansion of the digital I/O. Each I/O rack shall minimally contain four spare slots or 20% spare slots, whichever is greater, including the spare slots between the digital I/O and analog I/O modules noted above.
- F. Acceptable Manufacturers
 - 1. The PLCs shall be Allen-Bradley ControlLogix 1756-L8* series. In specific applications as shown on the Drawings or small standalone vendor control systems the PLC shall be Allen-Bradley CompactLogix.
- G. Signal Power Supplies
 - 1. Regulated DC power supplies shall be provided in each PLC enclosure for analog inputs, digital outputs, and digital inputs. Power supplies shall be suitable for an input voltage variation of ± 10 percent, and the supply output shall be fused or protected against short-circuiting. Output voltage regulation shall be as required by the instrumentation equipment supplied under another section.
 - 2. The loop power supply shall be separate from the power supply circuit for the processor and racks.
 - 3. The power source for all digital inputs from field devices shall be separately fused for each digital input module. Unless otherwise noted, all field devices will be provided with dry contacts that close to provide an input to the PLC.
- H. Appurtenances
 - 1. The PLC processor and I/O hardware shall be provided as complete systems, as shown on the control system block diagram drawings. The PLCs shall include all necessary hardware and software for a complete working system. All special rack or panel mounted power supplies, special interconnecting and programming cables, special grounding hardware, or isolation devices shall be furnished for proper operation of the equipment. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, intrinsically safe relays and current repeaters, surge suppression devices, and isolation devices shall be furnished and installed for proper operation of the equipment.
- I. PLC Arrangement
 - 1. The PLCs shall be distributed and arranged as indicated on the Drawings.
- J. Service Conditions
 - 1. Service conditions are indicated in the Instrumentation and Control System section.

2.02 PLC PROCESSOR

- A. The programmable logic controller processor shall be an industrial-type rack-mounted unit that utilizes nonvolatile type memory. Battery-backed memory is not acceptable. Each processor shall include onboard flash memory or CompactFlash card for storage of the user program. The processor shall automatically download the user program from nonvolatile memory upon startup after a power loss. Nonvolatile memory shall be programmable by the PLC or PLC software.
- B. Diagnostics
 - 1. The processor shall utilize self-monitoring diagnostic techniques and shall contain easily visible LED diagnostic indicators for "run" and "halt" conditions as well as memory and input/output error conditions. Diagnostic codes shall also be available through the programming device to facilitate troubleshooting.
- C. Programming Port
 - 1. The processor shall include a programming port that is available for programming and monitoring on-line after the system is fully functional, and after all communications, human machine interface (HMI), and network connections have been made. Removal or disruption of network communications, remote I/O communications, and HMIs to allow for on-line programming and monitoring will not be acceptable. A key switch shall be provided on the processor for selection of the operating mode and as a security measure.
- D. Communications
 - 1. The processor shall be programmed to operate autonomously, regardless of communications status with other units. Each programmable controller shall be furnished complete with communication modules for local and remote input/output hardware communications, communications with other programmable controllers, and communication with host computers as shown on the block diagram.
 - 2. DNP3 Over Ethernet Communication Modules
 - a. DNP3 modules shall be furnished as indicated on the Drawings and in the attached PLC Listing to facilitate PLC communication to the Owner's SCADA system. Modules shall be compatible with Allen-Bradley ControlLogix backplane and utilize Add-On Instructions (AOI) for data transfer and configuration. Modules shall be provided with CIPconnect-enabled network diagnostics and 10/100 Mbps auto crossover detection Ethernet configuration. DNP3 communication modules shall be capable of up to 40 IED connections and transmitting up to 300 commands. Modules shall have an integral 10/100 Base-T, RJ45 connector and link/activity LED indicators. DNP3 communication modules shall be manufactured by ProSoft Technology without exception.

- b. DNP3 modules for remote sites shall be ProSoft Technologies PLX51-DNPS. The master gateway for the East Tank shall be a ProSoft Technologies PLX51-DNPM.
 - 3. Modbus Serial Communication Module
 - a. Modbus serial modules shall be furnished as indicated on the Drawings and in the attached PLC Listing to facility PLC communications to existing pump controllers. Modules shall be compatible with Allen-Bradley ControlLogix backplane and utilize Add-On Instructions (AOI) for data transfer and configuration. Modules shall be provided with CIPconnect-enabled network diagnostics and 10/100 Mbps auto crossover detection Ethernet configuration. Modules shall have at minimum two serial ports.
 - b. Modbus serial modules shall be ProSoft Technology MVI56E-MCM.
- E. Environment
 - 1. The processor shall be suitable for operation in the environments specified in another section.
- F. Programming
 - 1. The processor shall be programmable using the IEC 1131 international programming standards and ladder logic programming. IEC 1131 programming shall include the following:
 - a. Functional Block Diagram.
 - (i) Function block programming is the Owner's standard. The I&C System Supplier shall receive written approval from the Owner to utilize ladder logic or structured text.
 - (ii) PLC programs shall utilize Rockwell PlantPAX process library Add On Instructions (AOIs).
 - b. Structured Text.
 - c. Ladder Diagram.
 - 2. Ladder logic programming shall include a minimum of the following capabilities:
 - a. Contacts, coils, branching.
 - b. Data comparisons.
 - c. On-delay and off-delay timers.
 - d. Counters with comparators.
 - e. Floating point Math and Logical instructions.
 - f. PID loop control.
 - g. Jumps and Subroutine functions.
 - h. Master control relay.
 - i. Transitional or one-shot outputs.
 - j. Standard and user-defined data tables for digital and analog value storage.
 - k. Remote I/O capability.
 - l. Fault-mode subroutine.

- G. Programming Capabilities
 - 1. The processor shall include the following capabilities for programming, debugging of programs, and troubleshooting:
 - a. Off-line programming.
 - b. On-line programming.
 - c. On-line status of coils and registers.
 - d. Input/output forcing.
- H. Hardware Configuration
 - 1. Processors shall be configured for standard rack mounting. Each programmable logic controller processor shall include integral communications ports for the programming device, remote input/output, HMI device, or remote communications interfaces.
- I. Input/Output Hardware
 - 1. Input/output hardware shall be arranged as indicated on the Drawings. Programmable logic controller systems shall support the following types of input/output modules:
 - a. 120 volt ac digital input and output.
 - b. 4-20 mA dc analog input and output.
 - 2. All digital input/output hardware shall include isolation against surges of at least 1500 volts. All output hardware connected to inductive loads shall be supplied with surge suppression devices and recommended by the PLC manufacturer to prevent damage to output hardware. Combination input/output modules will be acceptable if they meet the following requirements.
 - 3. Wiring Terminals
 - a. All input/output modules shall utilize easily removable plug-in or hinged field wiring terminals to allow removal of modules without disconnecting individual wires.
 - 4. I/O Circuit Power Supply
 - a. Outputs for motor driven equipment will typically be powered from the driven equipment. Digital outputs for miscellaneous equipment shall be powered either from the controlled equipment or the PLC enclosure as indicated on the Drawings or as coordinated with the controlled equipment supplier. Outputs that control process equipment specified under other sections or provided under other contracts shall be fully isolated or shall operate either interposing relays or relay-type digital output modules in the PLC cabinet.
 - 5. Digital Input Modules
 - a. Digital input modules shall sense voltages between 100 and 130 volts AC or 20 to 28 volts DC as indicated on the PLC Listing appended to this section. Modules shall have LED indicators for each point to display the status of the field contact. Each input module shall be suitable for being

connected to a separate voltage source and return. Return voltage may be common to the entire module unless otherwise indicated on the appended PLC Listing. Digital input modules shall have multiple inputs.

- b. 120VAC type digital input modules shall be Allen-Bradley 1756-IA16 or approved equal.
 - c. 24VDC type digital input modules shall be Allen-Bradley 1756-IB16 or approved equal.
 - d. 32-point 24VDC type digital input modules shall be Allen-Bradley 1756-IB32 or approved equal.
6. Digital Output Modules
- a. Digital output modules shall control voltages from 100 to 130 volts AC or 20 and 28 volts DC as indicated on the PLC Listing appended to this section and shall be rated at least 1 ampere. Outputs shall be individually fused and shall have LED indicators to display output status. Outputs shall withstand a surge of at least 80 amperes for one cycle and shall have an off-state leakage current not to exceed 2.0 mA. Digital output modules shall provide complete electrical isolation between individual output circuits. Digital output modules shall have multiple outputs.
 - b. 120VAC type digital output modules shall be Allen-Bradley 1756-OA16 or approved equal.
 - c. 24VDC type digital output modules shall be Allen-Bradley 1756-OB16 or approved equal.
 - d. 32-point 24VDC type digital output modules shall be Allen-Bradley 1756-OB32 or approved equal.
7. Relay Digital Output Modules
- a. Where indicated on the appended PLC Listing, digital output modules shall have dry contact relay type outputs suitable to control voltages from 24 to 110 volts dc and 24 to 230 volts ac and shall be rated at least 2 amperes. Outputs have LED indicators to display output status. Digital outputs for motor driven equipment shall be powered by the driven equipment. Outputs shall withstand a surge of at least 80 amperes for 15 milliseconds. Relay digital output modules shall have multiple outputs.
 - b. Relay digital output modules shall be 1756-OW16I or approved equal.
8. Analog Input Modules
- a. Analog input modules shall accept linear 4-20 mA dc signals from field transmitters. Analog to digital conversion accuracy shall be at least 12-bit (0-4095 count) resolution. Analog input modules shall have multiple inputs. Each input shall be fully isolated from the other inputs.
 - b. Analog input modules shall be Allen-Bradley 1756-IF8I or approved equal.
9. Analog Output Modules

- a. Analog output modules shall transmit linear 4-20 mA dc signals to field devices. Loop power for all analog outputs shall be provided by regulated power supplies in each input/output enclosure and shall be capable of driving a 0 to 600 ohm load. Digital to analog conversion accuracy shall be at least 12-bit (0-4095 count) resolution. Analog output modules shall have multiple outputs. Analog output modules shall be
 - b. Allen-Bradley 1756-OF8I or approved equal.
10. RTD Input Modules
- a. RTD input modules shall measure the resistance over a pair of conductors and calculate the respective process temperature. The input range of the RTD input module shall be configurable and have an analog-to-digital conversion accuracy of at least 24-bits. The modules shall support platinum, nickel, and copper RTD sensors. RTD modules shall have 8 input channels.
 - b. RTD input modules shall be Allen-Bradley 1756-IRT8I or approved equal.
11. Panel Terminations
- a. All PLC input/output signals for field connections shall be terminated through panel enclosure terminal strips. Direct connection of field wiring to the I/O module terminals is not acceptable.
12. Interposing Relays
- a. Interposing relays shall be incorporated on all I/O circuits as shown on the PLC input/output listing, where required by the application of isolate foreign power sources, where the continuous output rating of the PLC relay digital or output module is not sufficient to power the connected device or equipment, or where otherwise required by the System Supplier's equipment. Interposing relays shall be provided for any digital output module output signal that leaves the PLC enclosure. Interposing relays shall be mounted in the PLC enclosure containing the output module that activates the relays.

2.03 COMMUNICATIONS

- A. Each programmable controller system shall be furnished complete with communication hardware for local input/output hardware, remote input/output hardware, and other programmable logic controllers.
- B. Communication hardware shall be compatible with cable, data highway, fiber optic, or radio communications media as shown on the Drawings. Ethernet components and cabling are specified in the associated Division 13 sections.
- C. Addressability
 - 1. Each programmable logic controller shall be individually addressable so that only the selected controller responds when queried. IP addressing shall be used. Designation of a controller's network address may be either a software or hardware function.
- D. Communications Hardware

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1. System Supplier shall provide all necessary communications hardware. Hardware shall be included for, but not be limited to, remote I/O, data highway, host computer, fiber optics, Ethernet and radio.
2. PLC to PLC Communications Hardware
 - a. Each PLC shall communicate to other PLCs over a network as shown on the control system block diagram. System Supplier shall include all rack mounted, enclosure mounted, or desktop mounted communications modules required for a complete working system.
3. PLC to Remote I/O Communications Hardware
 - a. The master PLC shall communicate with the remote PLC rack over a remote I/O communications network. System Supplier shall include all rack mounted, enclosure mounted, or desktop mounted communications modules required for a complete working system.
4. PLC to Host Communications Hardware
 - a. Each PLC shall communicate to the host computer over a network as shown on the control system block diagram. System Supplier shall include all rack mounted, enclosure mounted, or desktop mounted communications modules required for a complete working system. The computer system hardware is covered in another section.

2.04 PROGRAMMING DEVICE HARDWARE

- A. One programming device shall be provided and shall be a portable laptop computer as specified in the Computer System Hardware section. System Supplier shall provide two interconnecting cables, each 5 meters long, to connect the computer to the programmable logic controller.

2.05 PROGRAMMING SOFTWARE

- A. System Supplier shall furnish two licensed copies of PLC programming software to the Owner. The software shall be suitable for running on a laptop computer running Windows 10 operating system software. A full legal set of programming software documentation shall accompany each copy of the software. Each copy of the programming software shall include all necessary device drivers and add-on software packages.
- B. Standard Product
 1. The programming software shall be personal computer based and a standard product of Rockwell Automation. The software shall be Allen-Bradley RSLogix Studio 5000 Logix Designer Professional Edition. The software version shall be confirmed with the Owner prior to program development and procurement.
- C. Programming Software Features
 1. The programming software shall allow off-line development of all PLC-related programming, including user annotation of the program, and creation and printing of application programs and I/O cross-reference lists. Special

programming tasks originally provided by System Supplier shall also be included.

2. On-line features shall include IEC-61131 standards program modification, ladder-logic modification, program language modification, monitoring of real-time ladder-logic execution, monitoring of program execution, monitoring and manipulation of timer and counter preset and present values, monitoring and forcing of physical I/O, and monitoring and manipulation of analog (register) and bit (binary) data table values. PLC and I/O hardware diagnostic and status information shall be accessible using the software in on-line mode.

2.06 SYSTEM ENCLOSURES

- A. Programmable logic controllers and input/output hardware shall be housed in shop-assembled panels as indicated on the Drawings and as described in the Panels and Appurtenances section.

2.07 OPERATOR INTERFACE TERMINALS

- A. Operator interface terminals (OIT) shall be microprocessor-based flat panel type. The unit shall have data entry capabilities and shall include a password security function. The unit shall be connected to the PLC and shall display status, alarm, and diagnostic information. The unit shall provide a nominal diagonal display area dimension of 12", with WXGA resolution, 18-bit color, and a luminance of 300 cd/m². The OIT shall be furnished with a minimum of 8 MB of flash memory and 8 MB of system memory. The operator interface unit shall be provided with an Ethernet port for communications, and two USB ports for programming. The OIT shall be rated NEMA 4X, suitable for panel face.
- B. Terminals shall be powered from 120 V ac, 60 Hz, single phase. Terminals shall be suitable for ambient temperatures of +32 to +130°F and a relative humidity of 5 to 95 percent.
- C. One licensed copy of the OIT software used to create the screens shall be turned over to the City upon successful startup and commissioning of the system.
- D. The operator interface unit shall be Allen-Bradley Model 2711P-T12W22A9P PanelView Plus 7 Performance 1200W, without exception.
- E. OIT shall provide graphic screens that shall be used by the operators to access all functions and setpoints necessary for comprehensive control. The I&C System Supplier shall be responsible for developing and configuring the custom graphic displays. Each piece of major process equipment that is monitored and controlled by the control system shall be displayed on the graphic screens. Graphic screens shall be representations of the equipment and piping. The screens must accurately show all devices and equipment that is part of the control loops. The System Supplier shall utilize the version of the SCADA System Software Standards and Conventions document modified for this project to define such items as proposed graphic display process line colors/representations; color standards for "on", "off", "opened", "closed", and "alarm" conditions; alarm handling conventions;

how items will be selected for control; methods for navigation between displays; address usage/naming conventions; and security setup. Proposed displays shall be submitted to the Engineer and Owner for approval as described in the Instrumentation and Control System section.

- F. Each new and existing OIT that is part of the Project shall be provided with a panel-mounted flush mount badge scanner. Contractor shall plan for installation of the badge scanner and install in close proximity to the OIT on the panel door. Badge scanner shall be configured to compare the scanned badge versus the user database programmed into the OIT by the Contractor. Contractor shall obtain the latest user database from the Owner. Badge scanners shall be rf IDEAS WAVE ID Plus Surface Mount, without exception, to match Owner's existing units.

PART 3 – EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. PLCs installation requirements are specified in Instrumentation and Control System section except as described herein.
- B. Field check, testing, and training shall be as specified in the Instrumentation and Control System section.

3.02 CONFIGURATION

- A. PLC Programming and Configuration
 - 1. Configuration services are specified in the Instrumentation and Control System section.
- B. Communications Configuration
 - 1. The communications shall be fully configured and installed by System Supplier and shall be operation before application software configuration by others. Communications shall be configured as shown on the Drawings.

END OF SECTION

13530-A PLC Listings

600 - SW Boulevard Sanitary and Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P600PMPLCCP01 P600PMPLCC01	Pump Station PLC	Y PV+1500	N	N	ControlLogix (See Notes)	120V AC	0	13 slot		(6) 8CH (1) 8CH RTD	(1) 8CH			ControlLogix PLC to be provided and installed by others as part of a separate contract
						120V AC	1	10 slot			(3) 16CH 120V	(2) 16CH 120VAC (4) 8CH Relay		

601 - 25th Street Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P601PMPLCCP01 P601PMPLCC01	Pump Station PLC	Y PV+1500	N	Y	ControlLogix (See Notes)	120V AC	0	10 slot		(5) 8CH (3) 8CH RTD				ControlLogix PLC to be provided and installed by others as part of a separate contract
						120V AC	1	10 slot			(6) 16CH 120V	(4) 16CH Relay		
						120V AC	2	10 slot		(6) 8CH	(2) 8CH			

603 - Broadway Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P603PMPLCCP01 P603PMPLCC01	Pump Station PLC	N		No existing PLC	N/A	120V AC	0	7 slot	(1) DNP3 Card, (1) ProSoft Modbus Serial	(1) 8CH Iso	N/A	(1) 16CH 120V	(1) 16CH 120V	

604 - North Airport Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P604PMPLCCP01 P604PMPLCC01	Pump Station PLC	N	N	N	CompactLogix L30ER	Dual	0	4 slot	(1) ProSoft Modbus TCP	(1) 8CH	N/A	(2) 16CH 120V	N/A	

606 - Gillis Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P606PMPLCCP01 P606PMPLCC01	Pump Station PLC	N		No existing PLC	N/A	120V AC	0	7 slot	(1) ProSoft Modbus Serial	(1) 8CH Iso	N/A	(1) 16CH 120V	(1) 16CH 120V	

13530-A PLC Listings

607 - Lydia Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P607PMPLCCP01 P607PMPLCO1	Pump Station PLC	N		No existing PLC	N/A	120V AC	0	7 slot	(1) ProSoft Modbus Serial	(1) 8CH Iso	N/A	(1) 16CH 120V	(1) 16CH 120V	

608 - Prospect Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P608PMPLCCP01 P608PMPLCO1	Pump Station PLC	N		No existing PLC	N/A	120V AC	0	7 slot	(1) DNP3, (1) ProSoft Modbus Serial	(1) 8CH Iso	N/A	(1) 16CH 120V	(1) 16CH 120V	

609 - Milwaukee Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P609PMPLCCP01 P609PMPLCO1	Pump Station PLC	N	N	N	CompactLogix L33ER	Dual	0	10 slot		(3) 8CH	(1) 8CH	(4) 16CH 24VDC	(1) 16CH 24VDC	

610 - Truman Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P610PMPLCCP01 P610PMPLCO1	Pump Station PLC	N	N	N	CompactLogix L30ER	Dual	0	4 slot	(1) DNP3	(1) 8CH	N/A	(2) 16CH 120V	N/A	

611 - Hawthorn Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P611PMPLCCP01 P611PMPLCO1	Pump Station PLC	N		No existing PLC	N/A	120V AC	0	7 slot	(1) DNP3, (1) ProSoft Modbus Serial	(1) 8CH Iso	N/A	(1) 16CH 120V	(1) 16CH 120V	

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612 - Blue Bank Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P612PMPPPLCCP01 P612PMPPPLC01	Pump Station PLC	N	N	Y	MicroLogix 1200	120V AC	0	7 slot		(1) 8CH Iso	N/A	(1) 16CH 120V	(1) 16CH 120V	

614 - South Airport Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P614PMPPPLCCP01 P614PMPPPLC01	Pump Station PLC	N	N	Y	SLC 5/05	120V AC	0	10 slot	(1) DNP3	(2) 8CH	(1) 8CH	(2) 16CH 120V	(1) 16CH Relay	

619 - North Church Estates Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P619PMPPPLCCP01 P619PMPPPLC01	Pump Station PLC	N	N	Y	SLC 5/03 ProSoft	120V AC (See notes)	0	7 slot	(1) DNP3	(1) 8CH		(1) 16CH 24VDC	(1) 16CH Relay	Replace existing 24V DC power supply with new 120V AC power supply in new rack

623 - Pied Creek Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P623PMPPPLCCP01 P623PMPPPLC01	Pump Station PLC	Y PV+7	N	N	ControlLogix 5572	120V AC	0	10 slot	(1) DNP3, (2) Ethernet/IP	(2) 8CH	(1) 8CH	(2) 16CH 24VDC	(1) 16CH Relay	

631 - First Creek Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P631PMPPPLCCP01 P631PMPPPLC01	Pump Station PLC	Y PV+1500	N	N	ControlLogix 5572	120V AC	0	10 slot	(1) DNP3, (1) Ethernet/IP	(2) 8CH	(1) 8CH	(4) 16CH 24VDC	(2) 16CH 24VDC	Replace existing ProSoft Modbus Card with a new DNP3 Card
						120V AC	1	10 slot	(1) Ethernet/IP			(3) 16CH 24VDC		

632 - Second Creek Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P632PMPPPLCCP01 P632PMPPPLC01	Pump Station PLC	Y PV+1500	N	N	ControlLogix 5572	120V AC	0	13 slot	(1) DNP3, (1) Ethernet/IP	(1) 8CH	(1) 8CH	(3) 16CH 24VDC	(1) 16CH 24VDC	Replace existing ProSoft Modbus Card with a new DNP3 Card

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637 - South Airport Relief Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P637PMPPPLCCP01 P637PMPPPLC01	Pump Station PLC	N	N	No existing PLC	N/A	120V AC	0	7 slot		(1) 8CH		(1) 16CH 120VAC	(1) 16CH 120VAC	

642 - Wildwood West Sanitation Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P642PMPPPLCCP01 P642PMPPPLC01	Pump Station PLC	N	N	Y	SLC 5/03 ProSoft	24V DC	0	10 slot	(1) DNP3	(1) 8CH	(1) 8CH	(1) 16CH 120VAC	(1) 16CH 24VDC	

643 - KCI Industrial Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P643PMPPPLCCP01 P643PMPPPLC01	Pump Station PLC	N	N	Y	SLC 5/03 ProSoft	120V AC (See notes)	0	7 slot	(1) DNP3	(1) 8CH		(1) 32CH 24VDC	(1) 32CH 24VDC	Replace existing 24V DC power supply with new 120V AC power supply in new rack

646 - Briarcliff West Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P646PMPPPLCCP01 P646PMPPPLC01	Pump Station PLC	N	N	Y	SLC 5/03 ProSoft	120V AC (See notes)	0	7 slot	(1) DNP3	(1) 8CH		(1) 16CH 24VDC	(1) 16CH 24VDC	Replace existing 24V DC power supply with new 120V AC power supply in new rack

657 - Northland Mobile Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P657PMPPPLCCP01 P657PMPPPLC01	Pump Station PLC	Y PV600	Y	Y	SLC 5/05	120V AC (See notes)	0	10 slot	(1) DNP3	(1) 8CH	(1) 8CH	(3) 16CH 24VDC	(1) 16CH 24VDC	Replace existing 24V DC power supply with new 120V AC power supply in new rack

659 - Chouteau Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P659PMPPPLCCP01 P659PMPPPLC01	Pump Station PLC	N	N	Y	ControlLogix 5562 (see notes)	120V AC	0	10 slot	(1) Ethernet/IP	(1) 8CH		(2) 16CH 24VDC	(1) 16CH 24VDC	Replace with ControlLogix L82 processor

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662 - Riverside Horizons Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P662PMPLCCP01 P662PMPLCO1	Pump Station PLC	Y PV+1250	N	Y	SLC 5/05	120V AC (See notes)	0	10 slot	(1) DNP3	(4) 8CH Iso	(2) 8CH			Replace existing 24V DC power supply with new 120V AC power supply in new rack. Additional DI cards from the current quantity have been listed to allow the incorporation of additional I/O from a vendor panel (see Drawings)
						120V AC (See notes)	1	10 slot				(7) 16CH 24VDC	(2) 16CH 24VDC	
P662PMPRIOCP01 P662PMPRIO01	RIO Panel	Y PV300	N - Demo only	Y	MicroLogix 1200				(1) Ethernet/IP			(2) 16CH 24VDC	(1) 16CH Relay	Existing 14CH DI and 10CH DO integral to processor. Functionality to be replaced by dedicated DI card and dedicated relay output card.

663 - Birchwood Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P663PMPLCCP01 P663PMPLCO1	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC (See notes)	0	7 slot		(1) 8CH		(1) 16CH 24VDC	(1) 16CH 24VDC	Replace existing 24V DC power supply with new 120V AC power supply in new rack

664 - Gregory Ridge Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P664PMPLCCP01 P664PMPLCO1	Pump Station PLC	Y PV+7	N	N	ControlLogix L81E	120V AC	0	7 slot		(1) 8CH		(2) 32CH 24VDC	(1) 16CH 24VDC	

667 - 12th Street Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P667PMPLCCP01 P667PMPLCO1	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC	0	7 slot	(1) DNP3	(1) 8CH		(1) 16CH 120VAC	(1) 16CH Relay	

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676 - South Airport Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P676PMPPPLCCP01 P676PMPPPLC01	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC	0	7 slot		(1) 8CH RTD		(3) 16CH 120VAC	(1) 16CH Relay	Replace existing isolated 8CH AC/DC discrete input modules with 16CH 120VAC discrete input modules.

677 - 118th & Lawndale Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P677PMPPPLCCP01 P677PMPPPLC01	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC	0	4 slot		(1) 8CH		(1) 16CH 120VAC	(1) 16CH 120VAC	

682 - Lake Waukomis Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P682PMPPPLCCP01 P682PMPPPLC01	Pump Station PLC	N		N	ControlLogix 5572	120V AC (See notes)	0	10 slot	(1) Ethernet/IP	(2) 8CH		(2) 16CH 24VDC	(1) 16CH Relay	Replace existing 24V DC power supply with new 120V AC power supply in new rack

684 - White Aloe Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P684PMPPPLCCP01 P684PMPPPLC01	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC (See notes)	0	7 slot		(2) 8CH		(1) 16CH 24VDC	(1) 16CH Relay	Replace existing 24V DC power supply with new 120V AC power supply in new rack

686 - Brush Creek Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P686PMPPPLCCP01 P686PMPPPLC01	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC (See notes)	0	10 slot		(2) 8CH		(2) 16CH 24VDC	(1) 16CH Relay	Replace existing 24V DC power supply with new 120V AC power supply in new rack

687 - Upper Rush Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P687PMPPPLCCP01 P687PMPPPLC01	Pump Station PLC	Y PV+7	N	N	ControlLogix 5572	120V AC	0	7 slot	(1) Ethernet/IP	(1) 8CH		(2) 16CH 24VDC	(2) 16CH Relay	Items listed are to be provided and installed by others as part of a separate contract

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688 - Harlem Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P688PMPPPLCCP01 P688PMPPPLC01	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC	0	7 slot		(1) 8CH		(3) 16CH 120VAC	(1) 16CH Relay	Replace existing isolated 8CH AC/DC discrete input modules with 16CH 120VAC discrete input modules

692 - 83rd Street Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P692PMPPPLCCP01 P692PMPPPLC01	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC (See notes)	0	7 slot		(1) 8CH		(1) 16CH 24VDC	(1) 16CH Relay	Replace existing 24V DC power supply with new 120V AC power supply in new rack

693 - Birmingham Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P693PMPPPLCCP01 P693PMPPPLC01	Pump Station PLC	Y PV+1500	N	N	ControlLogix 5572	120V AC	0	17 slot	(3) Ethernet/IP	(2) 8CH	(1) 8CH	(4) 16CH 120VAC	(1) 16CH Relay	

694 - Mace Road Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P694PMPPPLCCP01 P694PMPPPLC01	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC (See notes)	0	7 slot		(1) 8CH		(1) 16CH 24VDC	(1) 16CH Relay	Replace existing 24V DC power supply with new 120V AC power supply in new rack

696 - Weatherby Lake Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P696PMPPPLCCP01 P696PMPPPLC01	Pump Station PLC	Y PV+7	N	N	ControlLogix 5572	120V AC	0	7 slot	(1) Ethernet/IP	(1) 8CH		(2) 16CH 24VDC	(2) 16CH Relay	Items listed are to be provided and installed by others as part of a separate contract

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697 - Platte Woods Sanitary Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P697PMPPPLCCP01 P697PMPPPLC01	Pump Station PLC	N		Y	SLC 5/03 ProSoft	120V AC (See notes)	0	7 slot		(1) 8CH		(1) 16CH 24VDC	(1) 16CH Relay	Replace existing 24V DC power supply with new 120V AC power supply in new rack

699 - Kemper Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P699PMPPPLCCP01 P699PMPPPLC01	Pump Station PLC	N		Y	SLC 5/04	120V AC	0	10 slot		See Notes	See Notes	(3) 16CH 12VAC	(3) 8CH Relay	(1) 2CH AI/2CH AO card in panel. Provide one AI and one AO card as a replacement.

711 - Birmingham WWTP														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P711PMPPPLCCP01 P711PMPPPLC01	Plant PLC	Y PV+1500	N	N	ControlLogix 5572	120V AC	0	17 slot	(2) Ethernet/IP			(10) 16CH 24VDC	(2) 16CH 24VDC	
						120V AC	1	17 slot	(1) Ethernet/IP	(11) 8CH	(4) 8CH			

745 - KCI De-icing Flood Station														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
P745PMPPPLCCP01 P745PMPPPLC01	Pump Station PLC	N		No existing PLC	N/A	120V AC	0	4 slot	(2) Ethernet/IP			(1) 16CH 120V		

848 - East Tank														
Panel Tag/ PLC Tag	PLC Description	OIT (Y/N)	OIT Replaced?	PLC Replaced?	Existing PLC Processor	Power Supply	Rack #	Rack Size	Comm Cards	AI	AO	DI	DO	Notes
Rack Mounted P848PMPPPLC01	Data Concentrator PLC	N		No existing PLC	N/A	120V AC	0	4 slot	(1) DNP3, (1) Ethernet/IP			(1) 16CH 120V		

SECTION 13540 – RADIO EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers the furnishing of radio communication equipment for the Instrumentation and Control System. Radio equipment shall operate in conjunction with field devices such as PLCs, RTUs, etc., as described elsewhere in these Specifications. The radio equipment shall consist of base radios and remote radios.
- B. Control System
 - 1. The Instrumentation and Control System section shall apply to all equipment furnished under this section.

1.02 GENERAL

- A. Equipment furnished under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by the Engineer.
- B. General Equipment Stipulations
 - 1. The General Equipment Stipulations shall apply to all equipment provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.
- C. Drawings
 - 1. Supplementing this section, the Drawings show the configuration of the radio system, a location map of the sites, and antenna types with support and cable and mounting details. All hardware, including power supplies, special cables, and other appurtenant equipment, shall be provided to meet the functional requirements described herein and indicated on the Drawings.
- D. Accessories
 - 1. System Supplier shall provide all necessary equipment such as channel processors, line buffers, communication couplers, and modems, to transmit commands and receive data via communication channels. System Supplier shall also provide all radio transmitters, receivers, antennas, cabling, and mounting hardware for a complete operational radio system.

1.03 SUBMITTALS

- A. See Instrumentation and Control System section.
 - 1. Submittals shall be as specified in the Instrumentation and Control System section.

1.04 DELIVERY, STORAGE, AND SHIPPING

- A. Delivery, storage and shipping shall be as specified in the Instrumentation and Control System section.

1.05 SPARE PARTS

- A. The following spare parts shall be provided:

<u>Spare Parts</u>	<u>Quantity</u>
4RF Aprisa + Radio	1
Yagi Antenna	1

PART 2 – PRODUCTS

2.01 SERVICE CONDITIONS

- A. Service conditions are specified in the Instrumentation and Control System section.

2.02 220 MHZ RADIOS

- A. The scope of radio provisions in this contact includes the following:
 1. Master polling radio installed at the East Tank (Facility 848)
 2. Remote radios for communications to either the East Tank or to the North Oak Tank (Facility 847) as designated on the Drawings

- B. Radio General Characteristics

Number of channels (per radio):	1
Frequency Selection:	220/221 MHz
Adaptive Modulation:	QPSK to 64-QAM
Sensitivity:	-104 dBm
Antenna Gain (dBd):	9.5
Vertical Beamwidth:	43 degrees
Type of Antenna:	Yagi
Communications Data Baud Rate:	4800

- C. Communication Channel:
 1. Radios indicated on the Drawings or specified herein shall utilize frequency modulated, radio frequency as its communications medium.
 2. System transceivers shall operate on a dedicated channel pair in the 220-222 MHz band in conformance with FCC Rules and Regulations, Parts 47 CFR Part 90 and Subpart T. Bandwidth shall be 12.5 kHz.
 3. The specific frequency for each radio to use will be provided following contract award.
- D. System Equipment
 1. MAS radio transceivers shall be 4RF – Aprisa + 220-222 MHz without exception.
- E. Digital Interface

1. Interface shall be Ethernet for communications to the PLC by way of a security device and DNP3 Over Ethernet interface card.
- F. Radio System Diagnostics
1. The radios shall include system diagnostics to permit continuous or scheduled automatic monitoring of key operating parameters and alarm conditions.
 2. Communication
 - a. The diagnostic package shall communicate data from all remote transceiver radios in the system to the base radio and polling remote radio via the radio's RF channel.
 3. Radio Diagnostic Software
 - a. Diagnostic software capable of operation on the latest version of MS Windows 10 operating system shall be supplied to enable a workstation computer or notebook computer to communicate with the radio via a separate USB or Ethernet diagnostic port. The diagnostic software shall support the data/control functions specified herein and shall be fully loaded and operational on the notebook computer furnished hereunder or in another section as specified.
 - b. Diagnostics Data
 - (i) Diagnostic data transmitted over the radio frequency channel must use dual ton multi-frequency encoding to eliminate the possibility of diagnostic information being misinterpreted as data being sent from the SCADA system.
 4. Programming Device Hardware
 - a. The programming device shall be a portable laptop computer as specified in the Computer System Hardware section.
 5. Special Devices
 - a. System Supplier shall provide two sets of any special device (such as modems, adapter cards, interface converters, etc.) required to establish an operational programming line between the radios and programming device.
 6. Base Radio or Polling Remote Radio Diagnostic Data/Control Functions
 - a. The following functions shall be monitored by the diagnostic system:
 - (i) The operation and status of redundant transmitter, receivers, and power supplies; including automatic switch over to standby unit upon failure. All modules must be continuously monitored while on line and in standby states.
 - (ii) Remote switch over to the alternate transmitter or receiver to permit remote troubleshooting of radio hardware and software.
 - (iii) Remote testing of the hot standby switch over logic and alarm reporting logic.

- (iv) Power supply voltage, current, and transmission of power from redundant power supplies and transmitters.
- (v) Received signal strength, frequency offset, and FM deviation levels of redundant base radio, polling remote radio, or a repeater radio.
- b. The radio diagnostics shall permit remote adjustment of key parameters in the remote radio transceivers from a personal computer connected to the base radio or polling remote radio. The parameters shall include transmit power, transmit frequency offset, and transmit modulation deviation.
- c. Control and Display Capability
 - (i) Radio diagnostic software shall include control and display capability of the remote radio transceiver parameters listed below.
 - 1. Frequency (remote display and control).
 - 2. Deviation (remote display and control).
 - 3. Transmit Power Output (remote display and control).
 - 4. Receiver Signal Strength (remote display).
 - 5. Power Supply Voltage (remote display).
 - 6. Internal Voltage Regulator Voltage (remote display).
 - 7. Phase Lock Loop Voltage (remote display).
 - 8. Internal Radio Temperature (remote display).
- 7. Remote Transceiver Radio Diagnostic Data/Control Functions
 - a. The remote transceiver radio shall monitor its internal operation and diagnostic parameters from a hand-held terminal or personal computer plugged into the remote transceiver. A loop-back decoder board that operates in conjunction with the base radio or polling remote radio microprocessor to provide signal strength, frequency error, and deviation levels shall be supplied for each remote transceiver radio. The following data/diagnostic functions shall be supplied.
 - (i) Transmit and Receive Frequencies (display and control).
 - (ii) Time-out Timer Setting (display and control).
 - (iii) Soft-Carrier De-key Setting (display and control).
 - (iv) Loop-Back Code (display and control).
 - (v) Squelch Tail Eliminator (display and control)
 - (vi) Push-To-Talk Delay (display and control)
 - (vii) Clear-To-Send Delay (display and control)
 - (viii) Frequency (Remote display and control)
 - (ix) Deviation (Remote display and control)
 - (x) Transmit Power Output (display and control)
 - (xi) Receiver Signal Strength (display)
 - (xii) Power Supply Voltage (display)
 - (xiii) Internal Voltage Regulator Voltage (display)
 - (xiv) Phase Lock Loop Voltage (display)

(xv) Internal Radio Temperature (display)

2.03 SURGE SUPPRESSION

- A. System Supplier shall provide an in-line surge suppressor on antenna cables at each radio site to protect the radio equipment from damage by lightning. Surge suppressors shall be Polyphaser Series IS-B50LN-C2 or equal.
- B. Two lengths of Superflexible Heliac cable shall be supplied for each surge suppressor: one for the connection between surge suppressor and radio antenna port, and one for the connection between the coaxial transmission cable (1/2 inch and larger) and the antenna. The cable shall be terminated with standard N type connectors. The cable shall be Andrew Superflexible Heliac 1/4 inch Type FSS1-50A.

2.04 ANTENNA CABLE

- A. All cabling between antennas and radio transceivers shall utilize a splice-free foam dielectric coaxial cable cut to length. Foam dielectric coaxial cable shall consist of an inner conductor surrounded by a foam dielectric, a corrugated outer conductor surrounding the dielectric, and a polyethylene jacket. The installation shall use self-flaring connectors specifically designed for use with the cable. The antenna cable shall be grounded as indicated in the Drawings.
- B. All foam dielectric coaxial cable for all antenna locations shall be Andrew 1/2 inch Heliac, "Type LDF4-50A."

2.05 ANTENNAS

- A. System Supplier shall furnish the antennas and supporting structures at radio sites as indicated on the Drawings. Antennas shall have an S/N (flat weighing) 15 dBm threshold at antenna port (3 kHz channel) of -104 dBm S/N for FM digital.
- B. Omnidirectional Antennas
 - 1. Contractor to install an Owner-provided omnidirectional antenna on the East Tank Tower as shown on the Drawings.
- C. Directional Antennas
 - 1. A 9.5 dB directional Yagi antenna with a minimum 20 dB front-to-back ratio shall be provided for each remote transceiver radio site and polling remote radio site as indicated on the Drawings. Each antenna shall be of heavy-duty design for permanent installation, with gold anodized aluminum support boom and elements and mounting hardware supplied by the antenna manufacturer. The radiating element of the antenna shall be radome protected. Yagi antennas shall be Decibel DB498 or equal.
- D. Wooden Poles
 - 1. Wooden poles for mounting antennas shall be furnished in the lengths indicated at the locations indicated on the Drawings. The wooden poles shall be burn-branded on the face and the butt. The markings on the face shall be 6

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feet above ground line, assuming standard setting depths. The markings shall be as designated in ANSI 05.1, Paragraph 6.25. Each pole shall have a 15 degree one-way roof.

2. The poles shall meet the applicable requirements of ANSI 05.1 and AWPAC4.

E. Radio Masts

1. Self-supporting radio masts shall be furnished of the height at the location indicated on the Drawings. The mast shall be of tapered, tubular design, manufactured of high-strength steel, with a galvanized protective coating, and shall be mounted on a heavy-duty foundation designed and approved by the mast manufacturer. The mast shall be designed for the loading indicated on the Drawings and shall be Valmont Structures, or equal.

F. Grounding Conductors

1. All ground conductors shall be soft drawn copper cable or bar, not smaller than 12 AWG, bare or green insulated in accordance with the National Electrical Code.

G. Grounding Rods

1. Ground rods not described elsewhere shall be 5/8 inch diameter by 8 feet long, with a copper jacket bonded to a steel core.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. General installation requirements are described in the Instrumentation and Control System section.
- B. Radio Equipment
 1. The radio equipment shall be mounted in field device enclosures or in a separate enclosure as specified herein. Separate enclosures shall be furnished with the same NEMA rating and color as the field device enclosure.
- C. Radio Signal Strength Testing
 1. A physical radio path study has been performed for system configuration parameters, locations for repeaters, and for the sites indicated on the Drawings. The results of that study are included as an appendix to these Specifications.
- D. Functional Testing
 1. As a minimum, the following functional tests shall be performed on the communications equipment.
 2. Antenna Alignment
 - a. After each antenna is permanently installed, a power monitor shall be used to properly adjust the antenna for maximum signal strength. A written report on the monitoring results shall be submitted to the Engineer for review before the radios are placed into permanent operation.

3. Radio Frequency Check
 - a. After each radio has been installed but before it is placed into permanent operation, a frequency check shall be conducted to verify conformance with the specified tolerances. The frequency check shall be performed by a radio technician either employed or under subcontract to System Supplier.
4. Ping Test
 - a. The I&C System Supplier shall perform a ping test to verify communication between any new radio transmitters and repeaters.
5. A written report on the results shall be submitted to the Engineer and Owner for review.
- E. Surge Suppressor Installation
 1. Surge suppressors shall be bulkhead mounted on the radio enclosures and shall be suitable for the sizes of cable inside and outside the enclosures.
- F. Installation of Grounding Materials
 1. Electrical system grounding and equipment grounding shall be in compliance with the National Electrical Code.
- G. Antenna Installation
 1. System Supplier shall provide and supervise the installation of antenna equipment at radio sites as indicated on the Drawings. Damage to Owner's structures, tanks, or reservoirs caused by the Contractor shall be repaired to the Owner's satisfaction at Contractor's expense.

3.02 FCC LICENSE

- A. One or more frequency licenses has been granted to the Owner by the FCC. The licensed frequencies will be provided following contract award.

END OF SECTION

SECTION 13550 – SOFTWARE CONTROL BLOCK DESCRIPTIONS

PART 1 – GENERAL

1.01 SCOPE

- A. This section provides functional descriptions of the PLC and computer software requirements for the Instrumentation and Control System as indicated on the Drawings. These descriptions are intended to provide an overview of the operating concept of the plant process equipment rather than describing in detail every operating feature or interlock.
- B. Control System
 - 1. The Instrumentation and Control System section shall apply to all systems described in this section.

1.02 SUBMITTALS

- A. See section 13500 – Instrumentation and Control System
 - 1. Submittals shall be as specified in the Instrumentation and Control System section.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The descriptions are applicable to the software specified in the Computer System Software section and the Programmable Logic Controllers section.

PART 3 – EXECUTION

3.01 PLC PROGRAMMING FUNCTIONAL REQUIREMENTS

- A. The following paragraphs describe general configuration tasks that are required for the system PLC(s). These tasks shall be programmed in any applicable PLC. Each PLC may have multiple instances of each of these tasks or may have no instances of some or all of these tasks. The input/output lists (located in these documents as specified in the Instrumentation and Control System section) and detailed equipment control descriptions (included herein) shall be referenced to determine the requirements for each PLC.
- B. The following paragraphs cover functional requirements of the software, which are generic and may or may not be related to any specific control loop.
- C. Available Process Values
 - 1. All PLC-generated process alarm, equipment status, and process variable values shall be available at any operator workstation.
- D. Flow Values
 - 1. Flow values shall be integrated, totalized, and stored in the PLC registers so the values displayed on the HMI computers and on the field processor will be identical.
- E. System Failure

1. Failure of a PLC shall result in safe shutdown of associated process equipment. Interposing relays shall be provided where required to assure that equipment will revert to its fail-safe condition. Failure of any PLC or its communication shall be alarmed on the HMI computer.
- F. HMI Computers
1. The HMI computers shall function as a monitoring system, not as a controller, for the process equipment. The computer shall download set points and other information to the PLCs, and the PLCs shall perform all control algorithms, so a temporary failure of the any HMI computer will not disrupt plant control.
- G. Rack/Module Configuration
1. The rack and module definitions for each PLC, as well as the PLC communications configuration shall be completely configured to allow proper addressing of all field connected I/O points. This shall include configuration of any remote input/output (RIO) racks.
- H. PLC Database Definition
1. The PLC database will include both field I/O points and internally generated points required for programming. All field I/O points and internal programming points shall be fully defined according to database naming conventions approved by Owner. As a minimum, each database point shall be provided with a tag name, engineering unit, alarm parameters, and description.
- I. Analog Scaling
1. Each analog input and output will be appropriately scaled for use in internal PLC programming, monitoring by the HMI computers, or transmission to other PLCs. Requirements for raw count values shall be coordinated with the operator interface software to ensure compatibility.
- J. Equipment Runtimes
1. For each equipment item whose "run" status is monitored by a PLC, an internal equipment runtime shall be accumulated by the respective PLC. The runtime procedure will monitor the status of the equipment "run" contact and, when the equipment is running, increment a software timer that maintains equipment runtime to within a one-minute resolution. The timer shall stop incrementing, but not reset, when the "run" contact indicates that the equipment is not running. The timer value shall increment an hour counter that maintains an integer value representing the equipment run time in hours. The counter value shall be available for display on the HMI computer. A manual reset of the runtime value shall be available at the HMI computers for personnel at the supervisor level and above.
- K. Change-of-State Alarms
1. While equipment is controllable from the PLC ("in remote"), discrete output commands shall be compared to their respective process feedback status signal (where available) to verify proper execution. If the feedback status does not match the most recent output command (after an adjustable 2 to 300

second time delay), an alarm message shall be displayed on the HMI computer and the condition shall be logged as an alarm, requiring operator acknowledgment. The alarm shall remain energized until the proper discrete condition is sensed or until the operator resets the alarm through the HMI computer.

- L. Equipment Availability
 - 1. In general, equipment with PLC control has been provided with a local selector switch that transfers control to the PLC. The PLC shall monitor the position of this switch to determine if the equipment is available for PLC control. If the equipment is not available, the PLC program shall not attempt to implement remote manual or automatic status changes for the equipment. The PLC program may, however, need to implement special routines if equipment unavailability affects a sequence (as described in the detailed equipment descriptions).
- M. Maintained/Momentary Outputs
 - 1. The need for maintained or momentary control outputs shall be determined from the input/output listing and the electrical schematics. In general, equipment with only one control output indicated in the I/O list shall be programmed for a maintained control output. Equipment with two (or more) control outputs shall be programmed for momentary outputs. Provisions shall be made, in either case, to remove the active state (start, open, forward, initiate, etc.) control output when an equipment failure is sensed or when the equipment transitions from available to unavailable (local switch change).
- N. Equipment Mode Changes
 - 1. Unless otherwise indicated in the equipment control descriptions, equipment in automatic mode shall be transitioned to manual mode (and stopped) if the equipment fails or becomes unavailable or if the PLC processor resets.
- O. Manual/Auto Bumpless Transfer
 - 1. Unless otherwise indicated in the equipment control descriptions, equipment changes from automatic to manual control shall be bumpless. Equipment running or stopped in automatic mode shall remain running or stopped when manual mode is selected.
- P. East Tank Front-End Processing
 - 1. The East Tank PLC (PLC848PLC01) shall be built and programmed to act as a front-end processor for providing information from the following sites to the SCADA backbone:
 - a. Facility 603, Broadway Flood Station
 - b. Facility 608, Prospect Flood Station
 - c. Facility 610, Truman Flood Station
 - d. Facility 611, Hawthorn Floor Station
 - e. Facility 619, North Church Estates Sanitary Station
 - f. Facility 662, Riverside Horizons Sanitary Station

- g. Facility 667, 12th Street Sanitary Station
- 2. Communications over the radio system shall use DNP3 over Ethernet communications. The East Tank PLC and all PLCs that communicate to the East Tank shall be provided with a DNP3 over Ethernet card for this communication.
- Q. North Oak Tank Front-End Processing
 - 1. The North Oak Tank PLC (PLC847PLC01) was installed in a previous phase to act as a front-end processor. This PLC's program shall be programmed to additionally communicate from the following sites to the SCADA backbone:
 - a. Facility 623, Pied Creek Sanitary Station
 - b. Facility 631, First Creek Sanitary Station
 - c. Facility 632, Second Creek Sanitary Station
 - d. Facility 642, Wildwood West Sanitary Station
 - e. Facility 643, KCI Industrial Sanitary Station
 - f. Facility 657, Northland Mobile Sanitary Station
 - 2. Communications over the radio system shall use DNP3 over Ethernet communications. All PLCs that communicate to the North Oak Tank shall be provided with a DNP3 over Ethernet card for this communication.

3.02 HMI FUNCTIONAL REQUIREMENTS

- A. The following paragraphs describe general configuration tasks that are required for the HMI and related software.
- B. Database
 - 1. The system database, including field I/O and internal points shall be as indicated in the modified version of section 13500-A SCADA System Software Standards and Conventions.
- C. Trend Displays
 - 1. Trend displays shall be developed to present real-time and historical process data in an X-Y graph format. Real-time trends shall utilize current process values to generate temporary graphs that do not retain data values. Historical trends shall utilize historically collected data and shall access the data files directly for use in the trend display. Historical trends shall allow paging forward and back to the limits of the collected data. The trending package shall be configured to automatically retrieve historical data from the proper data file to accommodate the paging functions. Content of the trends will be determined after meeting with the Owner. Forty-five real-time trend displays and forty-five historical trend displays shall be provided.
- D. Alarms
 - 1. Complete system alarming shall be configured. This shall include configuration of graphical alarm displays, and configuration of audible alarms through the HMI speakers. All process or system alarms shall appear on an alarm summary screen and the alarm banner of each process graphic. Alarms and events shall be color coded on the alarm summary screen, with initial

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colors based on Owner conventions or the default colors associated with the graphics package. The colors may be adjusted after meeting with Owner. Alarm prioritizing and area assignments (if any) shall be coordinated with Owner at the first configuration meeting.

2. For LOW or LOW-LOW analog or discrete alarms which do not apply if associated equipment is not operating, provisions shall be made to prevent/Lock generation of the alarm unless the associated equipment is operating. This shall include alarms such as low amperage alarms for pumps that are not running. This may also include low flows or pressures when associated pumps are not operating (this will only apply if periodic operation of the equipment is considered normal).
3. All alarms/events shall be time stamped when displayed or printed. Unacknowledged alarms shall not automatically clear from the alarm summary if they return to normal before being acknowledged.

E. Reporting

1. System reporting shall be accomplished using the standard operator interface software-reporting package. All necessary report development, including macro development in spreadsheets, shall be supplied to access real-time and historical data for reporting. Five historical, monthly facility reports shall be provided.

F. Historical Data Collection

1. System data shall be collected for historical archiving and for use in trending and reporting functions. Requirements for data collection shall be as needed to support the trends and reports developed.

G. Manual Entry of Data

1. The human machine interface (HMI) computers shall allow manual entry of laboratory data and other variables, which shall then be available for display and use in reports. Operator entered commands from any of the HMI computers shall be logged at all HMI computers.

H. PlantPax Programming

1. PlantPax programming shall be implemented for all monitoring and equipment control on both HMI software and the PLC software. As a minimum, System Supplier shall plan to use the following PlantPax objects:

Object Name	Description
P_AInAdv	Object for processing analog inputs
P_LLS	Object for monitoring and controlling of a parallel group of motors
P_Motor	Object for monitoring and controlling constant speed pumps and motors
P_VSD	Object for monitoring and controlling variable speed drives (VSDs), otherwise referred to as variable frequency drives (VFDs) or adjustable frequency drives (AFDs)

Object Name	Description
P_ValveMO	Object for monitoring and controlling motor actuated/operated open/close valves
P_ValveC	Object for monitoring and controlling motor actuated/operated modulating valves

I. Network Configuration

1. The System Supplier shall be responsible for configuration of network communications to allow all SCADA System communications to occur.

Network configuration shall meet the requirements of the following:

- a. The IP addressing scheme shall follow the rules established by the Owner. Rules are not published for security reasons. System Supplier shall request a copy of the IP addressing scheme from the Owner after project notice to proceed has been executed.
- b. Network switches shall be configured to support virtual local area networks (VLAN) to segregate network traffic into the following general categories:

VLAN	Devices on VLAN
VLAN10	Servers, thin clients, engineering workstations/thick clients
VLAN11	PLCs
VLAN12	Operator interface terminals (OITs)
VLAN13	Device level Ethernet/IP and Modbus TCP networks including MCCs, UPSs, variable frequency drives (VFDs)

J. Identification Badge Scanners

1. The System Supplier shall be responsible for configuration and integration of WAVE ID Plus badge scanners used for user login authentication purposes on PanelView OITs and HMI Workstations.

- a. HMI Workstations will authenticate users through the Microsoft Active Directory networked server. The WAVE ID Plus badge scanner will scan the user badge, authenticate through the Active Directory server, and enter login credentials on the HMI Workstation.
- b. PanelView OITs will authenticate users locally through internal PanelView FactoryTalk security. Each OIT will have a corresponding WAVE ID Plus badge scanner to capture the user badge identification number and grant the ability for the user to log in. Custom configuration of the WAVE ID Plus badge scanner is required for integration with the PanelView OIT. Badge identification number will be transferred to the local PLC and logged to historian.

3.03 EQUIPMENT CONTROL AND CONTROL MODE OVERVIEW

A. The following paragraphs explain the general format and control modes that are used in the detailed equipment descriptions. These paragraphs apply to the attached, project specific, equipment control descriptions included herein.

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- B. General
 - 1. Appended to this section are the equipment control programming requirements, with requirements for both PLC programming and the minimum operator interface functions. The HMI requirements represent the anticipated display generation requirements and shall be adjusted if the PLC programming warrants adjustment.
- C. Control Modes
 - 1. There are two general control modes available for the process equipment: 1) remote manual, and 2) remote auto. Remote manual control provides a means for operators to adjust equipment status or setpoint, through the HMI, using manually initiated commands. Remote automatic control provides a means for automatically changing equipment status or setpoint based on measured process parameters, calculated values, or operator setpoints. Some equipment may have more than one remote auto mode.
 - 2. Descriptions for local control are included in the detailed equipment control descriptions. They are provided primarily for documentation purposes and for information. These controls are hardwired and require no programming effort.

3.04 DETAILED EQUIPMENT CONTROL DESCRIPTIONS

- A. The following paragraphs describe functional requirements for various software control blocks in the control systems. These descriptions are intended to provide an overview of the operational concept for the facilities, rather than describing in detail every operating feature or interlock.
 - 1. Reverse Engineering for PLC Replacements
 - a. System Supplier shall convert existing programs from their present form into an RS Studio 5000 format using PlantPax objects. Existing process logic concepts shall be preserved, but PlantPax objects shall be applied to all equipment. System Supplier shall document the reverse engineering process as part of the Stage 2 submittals before programming is finalized.
 - b. Applicable sites:
 - (i) Facility 612, Blue Bank Flood Station
 - (ii) Facility 614, South Airport Flood Station
 - (iii) Facility 619, North Church Estates Sanitary Station
 - (iv) Facility 642, Wildwood West Sanitary Station
 - (v) Facility 643, KCI Industrial Sanitary Station
 - (vi) Facility 646, Briarcliff West Sanitary Station
 - (vii) Facility 657, Northland Mobile Sanitary Station
 - (viii) Facility 662, Riverside Horizons Sanitary Station
 - (ix) Facility 663, Birchwood Sanitary Station
 - (x) Facility 667, 12th Street Sanitary Station
 - (xi) Facility 676, South Air Pumping Sanitary Station
 - (xii) Facility 677, 118th & Lawndale Sanitary Station
 - (xiii) Facility 684, White Aloe Sanitary Station

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- (xiv) Facility 686, Brush Creek Sanitary Station
 - (xv) Facility 688, Harlem Sanitary Station
 - (xvi) Facility 692, 83rd Street Sanitary Station
 - (xvii) Facility 694, Mace Road Sanitary Station
 - (xviii) Facility 697, Platte Woods Sanitary Station
 - (xix) Facility 699, Kemper Flood Station
2. PlantPax Implementation for Reused PLCs
 - a. All existing PLCs to be reused shall be updated to include PlantPax objects for all equipment. Equipment shall be controlled by the process logic already in place.
 - b. Applicable sites:
 - (i) Facility 604, North Airport Flood Station
 - (ii) Facility 609, Milwaukee Flood Station
 - (iii) Facility 610, Truman Flood Station
 - (iv) Facility 631, First Creek Sanitary Station
 - (v) Facility 632, Second Creek Sanitary Station
 - (vi) Facility 659, Chouteau Sanitary Station
 - (vii) Facility 664, Gregory Ridge Sanitary Station
 - (viii) Facility 682, Lake Waukomis Sanitary Station
 3. Implementation of New PLCs at Sites Previously not PLC-controlled
 - a. System Supplier shall program a new PLC at each site that did not previously have a PLC for local and/or remote monitoring and control, including using PlantPax objects for all equipment.
 - b. For the following sites that were previously monitored and controlled by one or more local level controllers, the System Supplier shall program the new PLC to monitor the level controllers. Control of the facility will remain with the existing controller(s).
 - (i) Facility 603, Broadway Flood Station
 - (ii) Facility 606, Gillis Flood Station
 - (iii) Facility 607, Lydia Flood Station
 - (iv) Facility 608, Prospect Flood Station
 - (v) Facility 611, Hawthorn Flood Station
 - c. For the following site, the System Supplier shall program a new PLC as a data concentrator for statuses from the existing PLCs, including using PlantPax objects for all equipment.
 - (i) Facility 745, KCI De-Icing Flood Station
 - d. For the following sites that were previously monitored and controlled by one or more local level controllers, the System Supplier shall program the new PLC to replace the function of the level controllers.
 - (i) Facility 637, South Airport Relief Flood Station. Equipment shall operate as follows:

Associated Equipment

Wetwell Level Transmitter,
Sewage Pumps 1, 2, 3 & 4
Sump Pump

Associated PLC

P637PMPPLC01

Associated Drawing(s)

637-I-701
637-I-901
637-I-902

Local Manual Mode

Local manual control of the pumps shall be provided at the equipment. The local control station shall have a HAND-OFF-AUTO (HOA) selector switch. When the HOA switch is in the HAND position, the pump shall run and shall stop when the HOA switch is switched back to the OFF position.

Local Auto Mode

Sump Pump– Local auto control of the sump pump is provided. When the HOA switch is in the AUTO position, the pump shall operate based on the sump float. The sump pump will only be monitored by the PLC and not controlled.

Sewage Pumps – Local auto mode not available

Remote Manual Mode

Remote manual control shall be provided through the PLC. When the HAND-OFF-AUTO (HOA) selector switch at the control station is in AUTO, the operator shall select MANUAL at the Operator Workstation and the pump shall be controlled from the Operator Workstation using operator manual commands. The pump shall start/stop based on the input entered at the Operator Workstation.

Remote Auto Mode

Remote auto mode shall be provided through the PLC. When the HAND-OFF-AUTO (HOA) selector switch at the control station is in AUTO, the operator shall select AUTO at the Operator Workstation and the pumps shall operate as a group to control the level in the wetwell.

The PLC will use the PlantPAX Lead/Lag/Standby instruction, P_LLS, to control the startup and rotation of the pumps to control the level. The pumps will be defined by the P_LLS instruction as lead, lag 1, lag 2, and lag 3. The order of rotation will be controlled by the P_LLS instruction.

The operator shall set the Lead Pump Start Level Setpoint, the Lag 1 Start Level Setpoint, the Lag 2 Start Level Setpoint, and the Lag 3 Start Level Setpoint at the Operator Workstation. When a start level setpoint is reached, the corresponding pump will be called to start. The operator shall set the Lead Pump Stop Level Setpoint, the Lag 1 Stop Level Setpoint, the Lag 2 Stop Level Setpoint, and the Lag 3 Stop Level Setpoint at the Operator Workstation. When a stop level setpoint is reached, the corresponding pump will be called to stop. The initial start and stop setpoints will be determined during field testing of the pump station.

If at any time the Wetwell Level High switch is energized, all pumps shall be called to start and shall remain running for a short time after the switch is de-energized. The time delay to keep the pumps running after the switch is de-energized shall be determined during field testing as to not run the wetwell dry.

Alarms

Sewage Pump (1-4) Overtemp/Moisture
Sewage Pump (1-4) Fail-To-Start
Sewage Pump (1-4) Fail-To-Stop
Wetwell High Level

Status Indications

The Operator Workstation shall indicate the following pump status:
Pump Running, Pump HOA Switch in Hand, Pump HOA Switch in Auto, Pump in HMI Manual/Auto, and Pump in Lead/Lag1/Lag2/Lag3.

PLC Powerup

On PLC powerup, control of the pumps shall be set to remote auto mode.

END OF SECTION

SECTION 13561 – PANEL MOUNTED INSTRUMENTS

PART 1 – GENERAL

1.01 SCOPE

- A. The Panel Mounted Instruments section covers the furnishing of all panel mounted instruments and accessories required for the Instrumentation and Control System as specified herein or as indicated on the Drawings.
- B. Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the Drawings or the Instrument Device Schedule.
- C. When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the Drawings or the Instrument Device Schedule.

1.02 DESIGN CRITERIA

- A. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the Drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the Drawings or the Instrument Device Schedule.
- B. Where possible, each instrument shall be factory calibrated to the calibration ranges indicated on the Drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. For "smart" devices, calibration data shall be stored digitally in each device, including the instrument tag designation indicated on the Drawings and/or Instrument Device Schedule.
- C. Panel mounted instruments for each filter in a water plant, shall be supplied with power from a common source.

1.03 SUBMITTALS

- A. See Section Instrumentation and Control System section.
 - 1. Submittals shall be as specified in the Instrumentation and Control System section.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The following paragraphs describe minimum device stipulations. The Drawings shall be used to determine any additional instrument options, requirements, or service conditions.
- B. Programming Device
 - 1. For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). The programming device shall include appropriate operation manuals and shall be included in the training stipulations. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.
- C. Configuration Software/Serial Interface
 - 1. Devices indicated as requiring a serial interface shall be provided with all accessories to properly communicate over the serial link. An appropriate cable shall be provided to allow the transmitter serial interface to be connected to a laptop computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under the Windows 10 operating system. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device need not be furnished.

2.02 PANEL FRONT MOUNTED DEVICES

- A. Switches, Lights, and Push Buttons
 - 1. Selector Switches
 - a. Selector switches shall be 30.5-mm, heavy-duty, oil-tight type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 V ac. Contact configuration shall be as indicated on the Drawings or for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty. Switches shall be Eaton/Cutler-Hammer "10250T", General Electric "CR104P", or Allen Bradley "800T".
 - 2. Indicating Lights
 - a. Indicating lights shall be 30.5-mm, heavy-duty, oil-tight type, with full voltage LED lamps. Legends shall be engraved on the lens or on a legend faceplate. Lights shall be push-to-test type. Indicating lights shall be Eaton/Cutler Hammer "10250T", General Electric "CR104P", or Allen Bradley "800T".
 - 3. Push Buttons
 - a. Push buttons shall be 30.5-mm, heavy-duty, oil-tight type. Legends shall be engraved on the push-button faceplate. Contacts shall be rated 10

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amperes continuous at 120 V ac. Push buttons shall be Eaton/Cutler-Hammer "10250T", General Electric "CR104P", or Allen Bradley "800T".

2.03 PANEL INTERIOR MOUNTED DEVICES

A. Power Supplies

1. Regulated dc power supplies for instrument loops shall be designed and arranged so that loss of one supply does not affect more than one instrument loop or system. Power supplies shall be suitable for an input voltage variation of ± 10 percent, and the supply output shall be fused or shortcircuit protected. Output voltage regulation shall be by the instrumentation equipment supplied. Multiloop or multisystem power supplies will be acceptable if backup power supply units are provided which will automatically supply the load upon failure of the primary supply. The backup supply systems shall be designed so either the primary or the backup supply can be removed, repaired, and returned to service without disrupting the instrument system operation. Multiloop power supply connections shall be individually fused so a fault in one instrument loop will be isolated from the other loops being fed from the same supply. Fuses shall be clearly labeled and shall be located for easy access. Multiloop supply systems shall be oversized for an additional 10 percent future load. Failure of a multiloop supply shall be indicated on the respective instrument panel or enclosure.
2. Power supplies shall be Phoenix Contact or approved equal.

B. Relays

1. Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL recognized and shall have not less than double-pole, double-throw contacts. Control circuit relays shall have silver cadmium oxide contacts rated 10 amperes at 120 V ac. Electronic switching-duty relays shall have gold-plated or gold alloy contacts suitable for use with low-level signals. Relays used for computer input, alarm input, or indicating light service shall have contacts rated at least 3 amperes. Time delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of ± 2 percent of setting. Latching and special purpose relays shall be for the specific application. Unless otherwise indicated, all relays shall have an integral pilot light that illuminates to indicate an energized condition. Relays shall be IDEC "Series RR"; Potter & Brumfield "Series KRP, CB"; or Struthers-Dunn "Series 219, 246".

C. Intrinsically Safe Relays

1. Relays shall be solid-state electronic type in which the energy level of the sensing or actuation circuit is low enough to allow safe use in hazardous areas. Relays shall be located in non-hazardous areas. Relays shall be manufactured by GEMS, Eaton/MTL, R.Stahl, Inc., or Turck.

D. Electronic Signal Booster/Isolators

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1. Electronic signal boosters and isolators shall have all solid-state circuitry and complete electrical isolation between the power supply and the input and output signals. Accuracy shall be ± 0.15 percent of span. Isolators shall be manufactured by Acromag, Moore Industries-International, Inc., or Phoenix Contact.
- E. Fixed Deadband Signal Monitors
1. Signal monitors shall accept an electronic analog input signal and shall provide an electrically isolated contact output that changes state when the input exceeds a predetermined value. Circuitry shall be all solid-state. Set point shall be fully adjustable and shall have a resolution of 0.1 percent of span. Trip point repeatability shall be 0.1 percent of span. Deadband shall be approximately 1 percent of span. Output relay contacts shall be single-pole, double-throw, and rated 5 amperes at 120 V ac. Monitors shall be capable of actuating from either an increasing or decreasing input signal and shall fail in the alarm or fail safe condition upon power failure. Signal monitors shall be manufactured by Acromag, Ametek Power Instruments, Moore Industries-International, Inc., or Phoenix Contact.
- F. Adjustable Deadband Signal Monitors
1. Signal monitors shall accept an electronic analog input signal and shall provide an electrically isolated contact output when the input exceeds a predetermined value. Circuitry shall be all solid-state. Set point shall be fully adjustable and shall have a resolution of 0.1 percent of span. Trip point repeatability shall be 0.1 percent of span. Deadband shall be adjustable from 1 to 99 percent by means of a potentiometer. Output relay contacts shall be single-pole, double-throw, and rated 5 amperes at 120 V ac. Where standard deadband is not adjustable up to 99 percent, a dual alarm unit wired to a seal-in relay may be used as an alternate. The dual alarm set points shall be clearly marked "On/Off" or "Upper/Lower" set point. Signal monitors shall be manufactured by Acromag, Ametek Power Instruments, Moore Industries-International, Inc., or Phoenix Contact.
- G. Strip Heaters
1. Electric strip heaters shall be provided as indicated on the Drawings, as specified, and for the application. Strip heaters shall be sized to prevent condensation within the enclosure and to maintain the equipment above its minimum operating temperature. Strip heaters shall be located to avoid overheating electronic hardware or producing large temperature fluctuations. Strip heaters shall be controlled by adjustable thermostats with adjustment ranges of 30 to 90 °F. A circuit disconnect switch shall be provided within the enclosure.
- H. Intrinsically Safe Barriers
1. Barriers shall be solid-state electronic type in which the energy level of the sensing or actuation circuit is low enough to allow safe use in hazardous areas.

Barriers shall be located in non-hazardous areas. Barriers shall be manufactured by MTL, R. Stahl, Inc., or Turck.

PART 3 – EXECUTION

3.01 FIELD SERVICES

- A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

END OF SECTION

SECTION 13566 – MISCELLANEOUS INSTRUMENTS

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers the furnishing of all miscellaneous instruments and accessories required for the Instrumentation and Control System as specified herein or as indicated on the Drawings.
- B. Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the Drawings or the Instrument Device Schedule Drawings.
- C. When multiple miscellaneous instruments of a particular type are indicated, and each requires different selectable features, the required features are described on the Drawings or in Instrument Device Schedule Drawings.

1.02 DESIGN CRITERIA

- A. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by System Supplier.
- B. Primary elements shall derive any required power from the transmitter, unless otherwise indicated.
- C. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the Drawings or as indicated in the Instrument Device Schedule Drawings. The instruments shall be installed at the locations indicated on the Drawings or the Instrument Device Schedule Drawings.

1.03 SUBMITTALS

- A. Submittals shall be made as specified in Instrumentation and Control System section.

1.04 SHIPMENT, PROTECTION, AND STORAGE

- A. Equipment provided under this section shall be shipped, protected, and stored as specified in the Instrumentation and Control System section. Identification of packaging shall be as described in the Instrumentation and Control System section.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The following paragraphs provide minimum device stipulations. The Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.
- B. Interconnecting Cable
 - 1. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter. Length of cable shall be a minimum of three meters or as indicated in the Instrument Device Schedule Drawings.
- C. Programming Device
 - 1. For instruments that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). The programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.
- D. Configuration Software/Serial Interface
 - 1. Devices indicated as requiring a serial interface shall be provided with all accessories required to properly communicate over the serial link. An appropriate cable shall be provided to allow the transmitter serial interface to be connected to a personal computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under Microsoft's Windows 10 operating system. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device shall not be furnished.

2.02 MISCELLANEOUS INSTRUMENTS

- A. Milliamp Calibrator
 - 1. The calibrator shall be a portable battery powered unit capable of reading and generating the following signals:
 - a. Read 0 to 50 mA DC.
 - b. Power and read 2-wire transmitters at 24V DC supply, 4-20 mA.
 - c. Simulate 2-wire transmitters with external 24V DC supply, 4-20 mA.
 - d. Read 0-99 V DC.
 - e. Output a 0 to 24 mA DC signal into a 0 to 1200 ohm load.
 - 2. The calibrator shall have a 4 digit LCD display with an accuracy of 0.05 percent and shall have a "4" and "20" mA quick check output feature.

The calibrator shall be provided with a carrying case, test leads, a set of batteries, and an ac power adapter. The calibrator shall be Fluke 707, PIE 334, Meriam M334, or approved equal.

B. Multi-function Instrument Calibrator

1. The calibrator shall be completely portable and shall be capable of measuring and generating milliamperes, millivolts and volts. The calibrator shall have one 4-1/2 digit display capable of indicating either calibrator input or output. The display indication (output or input) shall be switch selectable. The input display shall be bipolar, complete with a minus (-) sign.
2. Inputs shall range from -50 to +50 volts; -100 to +100 mV; and -50 to +50 mA dc. Outputs ranges shall cover 0 to 110 mV, 0 to 11 volts and 0 to 22 mA dc. Input and output accuracy shall be ± 0.1 percent of full scale and shall be traceable to the National Institute of Standards and Technology. The calibrator shall be capable of simulating a two-wire transmitter operating from an external supply voltage of 12 to 65 V dc or driving an external load of 0 to 400 ohms at 20 mA dc from the calibrator's internal 24 V dc supply. The calibrator shall have input-output isolation and shall be protected against misconnection and overvoltage.
3. The calibrator shall be powered from a snap-in battery pack capable of operating the calibrator for 8 hours at 20 mA continuous output. The calibrator shall be supplied with two battery packs, a separate battery charger, a carrying case, an instruction manual, and test leads. The calibrator shall be Fluke 726 Precision Multifunction Calibrator.
4. The calibrator shall be capable of measuring pressure in inches of water [kPa] or psig [kPa gage]. Accuracy of pressure measurement shall be 0.07 percent of full scale and shall be traceable to the National Institute of Standards and Technology. The pressure modules shall have over pressure relief that protects calibration and shall be compatible with nonconductive, noncorrosive, instrument-grade clean air or clean inert gas. Pressure ranges and modules shall be provided as follows:
 - a. Dual Scale: 0-10 PSIG; 0-280" H₂O
 - b. Dual Scale: 0-33 PSIG; 0 to 830 inches H₂O
 - c. Single Scale: 0 to 100 psig
5. The calibrator shall be provided with fittings, connecting tubing and a portable air supply pump.

PART 3 – EXECUTION

3.01 FIELD SERVICES

- A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section.
- B. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. The System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

END OF SECTION

SECTION 13570 – PANELS AND APPURTENANCES

PART 1 – GENERAL

1.01 SCOPE

- A. The Panels, Consoles and Appurtenances section covers the furnishing of panels, consoles, and appurtenances as indicated on the Drawings and listed in the attached Equipment Schedules.
- B. This section also describes requirements for panels furnished under other sections whose respective specification refers to this section. Panels furnished under other sections are not listed in the attached Equipment Schedules.
- C. Control System
 - 1. The Instrumentation and Control System section shall apply to all equipment furnished under the Panels and Appurtenances section.

1.02 GENERAL

- A. Equipment furnished and installed under this section shall be fabricated and assembled in full conformity with the Drawings, specifications, equipment schedules, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by the Engineer.
- B. General Equipment Stipulations
 - 1. The General Equipment Stipulations shall apply to all equipment and materials provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.
- C. Seismic Design Requirements
 - 1. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.
- D. Drawings
 - 1. General dimensions and arrangements are indicated on the Drawings and attached Equipment Schedules. System Supplier shall be responsible for coordinating the console and enclosure sizes and arrangements to accommodate the equipment provided.
- E. The I&C System Supplier or responsible control panel fabrication supplier shall be UL508A certified.

1.03 SUBMITTALS

- A. Submittals shall be made as specified in the Instrumentation and Control System section.
- B. Submit confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1.04 DELIVERY, STORAGE, AND SHIPPING

- A. Delivery, storage and shipping shall be as per The Instrumentation and Control System section.

1.05 SPARE PARTS

- A. Spare parts shall be provided as specified below:

Spare Parts	Quantity
24 volts DC power supplies	2
Fuses	20 of each size
Panel-mounted UPS	1

PART 2 – PRODUCTS

2.01 PANEL DESIGN AND FABRICATION FEATURES

- A. All panels furnished shall conform to the stipulations of NEMA ICS-6-1993 (R2001, R2006). Unless indicated otherwise on the Drawings, the following paragraphs describe general fabrication specifications for the PLC cabinets, instrument panels, consoles, enclosures, and subpanels.
 - 1. Fittings
 - a. Compression type bulkhead fittings shall be provided near the bottom or the top of the panel for all field connections. Compression nuts and sleeves shall be provided for the field connections. Indicators, recorders, controllers, and other pneumatic devices shall be provided with plugged test connections and shutoff valves for isolation.
- B. Power Entrance
 - 1. The power entrance to each panel shall be provided with a surge protection device. Refer to the Instrumentation and Control System section for surge suppression requirements.
- C. Control Panel 120VAC Power Distribution
 - 1. Each device powered from control panel 120 volts AC sources whether UPS or non-UPS source shall be provided with a DIN-rail mounted circuit breaker for protection and easy isolation from other devices.
- D. Power Wiring
 - 1. Power distribution wiring on the line side of panel fuses shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 14 AWG. Wiring for ac power distribution, dc power distribution, intrinsically safe, and control circuits shall have different colors and shall agree with the color-coding legend on System Supplier's panel wiring diagrams. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for not less than 600 volts, with a moisture resistant and flame retardant covering rated for not less than 90°C.
- E. Instrument and Control Wiring
 - 1. All internal panel wiring shall be type MTW stranded copper wiring rated not less than 600 volts. Electronic analog circuits shall be twisted and shielded

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pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits. Intrinsically safe circuits shall be physically separated from other circuits in accordance with applicable codes. Wires within the panel shall conform to the minimum size as shown in the table below:

Type	Min. Wire Size	Color
AC Control	16 AWG	Red
DC Control	16 AWG	Blue(+), Blue w/ white stripe (DC GND)
Analog Circuits	18 AWG Twisted Pair	Black(+)/White(-)
Foreign voltages	16 AWG	Yellow
AC Equipment Ground	Refer to associated equipment specification	Green

2. All wiring shall be grouped or cabled and firmly supported inside the panel. Each individual wire in power, control, and instrumentation circuits shall be provided with identification markers at each point of termination. The wire markers shall be positioned to be readily visible for inspection and the identification numbers shall match the identification on the supplier's panel wiring drawings. Wiring shall be bundled in groups and bound with nylon cable ties or routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel, with removable covers, and with space equal to at least 40 percent of the depth of the duct remaining available for future use after completion of installation and field wiring. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.

F. Terminal Blocks

1. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fuses or circuit breakers shall be clearly labeled and located for easy maintenance.
2. Terminals shall be screw-down type without exception. Terminals shall be provided with stand-off rail to allow easy access to the terminals and to the wiring. Terminals shall be manufactured by Phoenix Contact or approved equal.

G. Backup Power

1. Power supply to the panels shall be from electrical sources shown on the Drawings, which may be backed by redundant utility feeds, engine generators, or externally mounted uninterruptible power supplies (UPSs) specified in other sections.
2. Where indicated in the attached Equipment Schedules, on the Drawings or in the referring equipment specifications, free-standing vertical panels and wall cabinets shall each be provided with an interior-mounted UPS to provide backup power to critical loads upon loss of power supply to the panel. UPS-backed power shall be provided to the programmable logic controller CPU, instrument loops, I/O modules (operating and wetting voltages), all network communications devices, and any other load essential to preventing loss of control system function. Backup power for panel interior lights, heaters, and convenience receptacles is not required. UPSs for free-standing vertical panels and wall cabinets shall meet the requirements specified below.
3. UPS for Free-Standing Vertical Panels and Wall Cabinets
 - a. Each UPS shall accept incoming 120 volts ac, 60Hz, single-phase utility power, apply surge protection, and supply power to the connected loads. The UPS shall be a double-conversion (“on-line”) type to provide a breakless transfer to backup power. In the event of incoming power failure, the UPS shall provide 120 volts ac, 60 Hz, single-phase power to its connected loads by inverting power stored within integral storage batteries. The UPS shall be contained inside the enclosure and supported by a dedicated shelf attached to the backplane or sidewall. The shelf shall be between 12 and 18 inches from the bottom of the enclosure and shall not be directly above any electronic or electromechanical devices.
 - b. The UPS shall have at least two integral NEMA 5-15R receptacles for connection of battery-backed loads. Upon restoration of incoming power, the UPS shall recharge the batteries and return its connected loads to the incoming power source. The factory-installed line cord and plug shall not be altered. The UPS output shall be connected by plug and line cord to terminal blocks as necessary to distribute power to loads not having a power cord and plug; all other loads shall be connected directly to the UPS’s integral receptacles or to permanently installed receptacles fed from the UPS output.
 - c. The UPS shall maintain a temperature-compensated, float charge voltage on the batteries when utility power is available. Overcurrent protection when utility power is available shall be from a circuit breaker internal to the UPS. The UPS shall be intrinsically current-limiting when the unit is on battery.
 - d. The UPS shall meet the following requirements:

Capacity, minimum:	1000 VA/ 700 watts
Filtering and surge protection:	Meets IEEE/ANSI C62.41 Category B (IEEE 587)
Voltage, output (on battery):	120 volts \pm 3 percent
Voltage, output (on-line):	Nominal \pm 3 percent
Frequency and waveform, output (on battery):	60 \pm 0.3 Hz, true sine-wave
Efficiency, minimum (on-line):	90 percent
Operating Environment:	0 to 40°C; 0 to 95 percent relative humidity, non-condensing
Backup time, minimum at half of rated load:	30 minutes
Recharge time, maximum to 90 percent of full charge:	12 hours

- e. The UPS shall have spare capacity of at least 30 percent based on actual connected loads. The System Supplier shall advise the Engineer if the UPS capacity needs to be higher than specified above to meet this requirement.
- f. The UPS shall have a visual status indicator for low (or faulty) battery and incoming ac power failure. The UPS shall emit an audible signal when the UPS is operating on battery power. A relay shall be installed within the panel and its coil connected across the UPS input power as a means of providing a contact for remote indication of a power failure condition.
- g. The UPS shall be furnished with an Ethernet network card with RJ-45 connector for communicating status and alarm conditions to the Instrumentation and Control System PLC and HMI. Communication shall be via 10/100-BaseT Ethernet and shall use HTTP, SMTP, SNMP, Modbus TCP, or other protocol as necessary to transfer the information into the PLC and HMI database for display and alarming. Special software or drivers necessary to complete the communications link shall be furnished with the UPS systems. One copy of any special software or drivers necessary to allow monitoring over the network shall be provided for all UPSs furnished under this section.
- h. Batteries shall be sealed maintenance-free, gelled electrolyte lead-acid, or valve-regulated, maintenance-free, lead-acid. Flooded-electrolyte type batteries will not be acceptable.
- i. The UPS shall be APC “Smart-UPS”, Vertiv/Liebert “GXT4”, Toshiba “1000 Series”, or equal.
- j. Each UPS shall be mounted within a free-standing vertical panel or wall cabinet on a pivot shelf to prevent obstruction of the panel components, as shown on the Drawings. The pivot shelf shall be attached to the floor of the panel and rotate 90 degrees to swing outside of the panel, providing

access to the panel components behind. The pivot shelf shall be sized to accommodate the size and weight of the UPS without overhang and shall include straps to secure the UPS to the shelf. Pivot shelves shall also be installed in existing panels for UPSs being provided in existing panels. Pivot shelves shall be as manufactured by Crusoe or equal.

4. Rack-Mounted Uninterruptible Power Supply (UPS)
 - a. The UPS shall accept incoming 120 volts ac, 60 Hz, single-phase utility power, apply surge protection, and supply power to the connected loads. The UPS shall be a double-conversion (“on-line”) type. In the event of incoming power failure, the UPS shall provide 120 volts ac, 60 Hz, single phase power to its connected loads by inverting power stored within integral storage batteries. UPS output shall be true sine-wave under both utility and battery operation.
 - b. The UPS shall be EIA 19-inch, rackmount-type and shall be furnished with all mounting accessories necessary to install it within the enclosure. The UPS shall have at least four integral NEMA 5-15R receptacles for connection of battery-backed loads. Upon restoration of incoming power, the UPS shall recharge the batteries and return its connected loads to the incoming power source. The factory-installed line cord and plug for input connection shall not be altered.
 - c. The UPS shall maintain a temperature-compensated, float charge voltage on the batteries when utility power is available. Overcurrent protection when utility power is available shall be from a circuit breaker internal to the UPS. The UPS shall be intrinsically current-limiting when the unit is on battery.

5. The UPS shall meet the following requirements:

Capacity, minimum:	2000 VA/1400 watts
Voltage, output (on battery):	120 volts ± 2 percent
Frequency, output (on battery):	60 ± 0.5 Hz
Efficiency, minimum (on-line):	90 percent
Operating Environment:	0 to 40°C; 0 to 95 percent relative humidity, non-condensing
Backup time, minimum at half of rated load:	30 minutes
Recharge time, maximum to 90 percent of full charge:	8 hours

6. The UPS shall have a visual status indicator for low (or faulty) battery, on bypass, UPS fault, and incoming ac power failure.
7. The UPS shall be furnished with an Ethernet network card with RJ-45 jack for communicating status and alarm conditions to the Instrumentation and Control System HMI. Communication shall be via 10/100-BaseT Ethernet and shall

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use HTTP, SMTP, SNMP, or other protocol as necessary to transfer the information into the HMI database for display and alarming. One copy of any special software or drivers necessary to allow monitoring over the network shall be provided for all UPSs furnished under this section.

8. Batteries shall be sealed maintenance-free, gelled electrolyte lead-acid, or valve-regulated, maintenance-free, lead-acid. Flooded-electrolyte type batteries will not be acceptable. Additional rack-mounted battery modules shall be supplied to meet runtime requirements.
9. The UPS shall be APC “Smart-UPS RT”, Vertiv/Liebert “GXT4 Rack Mount”, Toshiba “1000 Rack Mount”, or equal.

H. Device Tag Numbering System

1. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the Instrument Device Schedule and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand-lettered labels or tape labels will not be permitted.

I. Nameplates

1. Nameplates shall be provided on the face of the panel or on the individual device. Panel nameplates shall have legends and approximate dimensions as indicated on the Drawings and shall be made of laminated phenolic material having engraved letters approximately 3/16 inch [5 mm] high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified under the Device Tag Numbering System paragraph.

J. Indicating Light Color Designations

1. Indicating lights shall be colored as shown in the following table unless indicated otherwise on the Drawings, in other specification sections, or in the Instrument Device Schedule Drawings.

Color	Meaning
Red	Associated equipment or device is “running”, “open”, or in an unsafe state or position.
Green	Associated equipment or device is “stopped”, “closed”, or in a safe state or position.
Cyan	Associated valve in “intermediate” position.
Amber	Associated equipment or device has “failed” or a process alarm condition is present or imminent.

White	Power source is on and functional.
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- K. Painting
 - 1. Interior and exterior surfaces of all carbon-steel panels shall be thoroughly cleaned and painted with rust inhibitive (universal) primer. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils [100 mm]. Color shall be ANSI 61 gray.
- L. Panel-Mounted Instruments
 - 1. Instruments, power supplies, pilot devices, and appurtenances mounted within or on the face of the panel shall meet the requirements specified in Section 13561, Panel Mounted Instruments, for those items unless noted otherwise herein, on the Drawings or, if applicable, within the referring equipment specification section.
 - 2. Panels provided for unconditioned indoor service shall be provided with a thermostatically controlled ventilation fan as indicated in the attached schedules. Each vent shall be provided with a filter to minimize dust intrusion. Blank plates shall be provided to completely isolate the fan/filter if desired. The ventilation fan shall be provided with a disconnecting means to prevent the fan from running. Panel ventilation fans shall be Hoffman or equal.
 - 3. Panels provided for outdoor service or mounting in an outdoor enclosure shall be provided with a thermostatically controlled strip heater. The thermostat shall be specifically designer for heating service. Panels for outdoor service shall not have ventilation provisions. The heater shall be provided with a disconnecting means to prevent the heater from turning on. Refer to section 13561 Panel Mounted Instruments for strip heater requirements.
- M. Grace Ports
 - 1. PLC control panels shall be provided with grace ports on the exterior of the enclosure. Grace ports shall be provided with an Ethernet RJ-45 port connected via CAT6 communications cabling to the associated ethernet switch mounted in the control panel. Grace ports shall be provided with a 120-volt AC duplex receptacle to power portable laptop computers. Grace ports shall be manufactured by Grace Technologies or approved equal.
- N. Factory Test
 - 1. Panels shall be factory tested electrically by the panel fabricator before shipment.

2.02 FREESTANDING VERTICAL PANELS

- A. The following paragraphs specify the freestanding vertical panels.
- B. Construction

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1. Panel construction shall be an indoor, dusttight, completely enclosed cubicle formed from steel structural members and steel plates. The base shall be formed of steel channels, with flanges extending upwards. The base shall be provided with 1/2 inch [12.5 mm] diameter holes at 12 inch [300 mm] centers so that the base can be bolted to the concrete equipment base. Welds, seams, and edges on all exposed surfaces shall be ground smooth. Suitable lifting facilities shall be provided for handling and shipment.
- C. Structure
1. Panel structure shall be suitably braced and of sufficient strength to support all equipment mounted on or within, to withstand handling and shipment, to remain in proper alignment, and to be rigid and freestanding. Top, sides, and back shall be fabricated from USS 10 gage [3.42 mm thick] or heavier carbon steel sheets, with stationary back suitable for back to wall installation, or designed for rear access with hinged back doors. Doors shall not be greater than 24 inches [600 mm] wide or spaced not greater than 36 inches [900 mm] center to center. Rear access doors shall be fabricated from USS 14 gage [1.9 mm thick] or heavier carbon steel.
- D. Panel Front
1. The front shall be a hinged door, or doors, with mounted instruments and control devices, fabricated from USS 10 gage [3.42 mm thick] carbon steel sheet and suitably braced and supported to maintain alignment. Panels with hinged fronts shall be of sufficient width to permit door opening without interference with rear projection of flush mounted instruments.
- E. Doors
1. Doors shall be essentially full height, having turned back edges and additional bracing to ensure rigidity and prevent sagging. Doors shall be mounted with strong, continuous, piano type hinges. Positive latches, acting from a common door handle, shall hold doors securely compressed at top, side, and bottom against rubber gaskets.
- F. Mounted Instruments
1. The front shall be stationary, with mounted instruments and control devices, fabricated from 3/16 inch [5 mm] carbon steel plate. Panel fronts shall be suitably reinforced between mounting cutouts and drilling to support instruments and devices without deformation and shall be free from waves and other imperfections, Panel fronts shall be recessed at the base. Adjoining panel sections shall be accurately shop fitted to assure satisfactory assembly in the field.
 2. Instrument Arrangement
 - a. Panel instruments and control devices shall be arranged in a logical configuration for the plant operators. The centerline of recorders shall be within 3 feet [900 mm] and 5'-9" [1.75 m] above the base of the panel for convenient reading and chart replacement. Control switches shall be

within 6 feet [1.83 m] and 2'-6" [760 mm] above the base of the panel. Indicators may be located within 2'-6" [760 mm] and 6'-6" [1.98 m] above the base of the panels. Annunciators and clocks may be mounted near the top of the panels.

- G. Conduit Entrance
 - 1. The bottom shall be open and components shall be arranged for external wiring conduit to enter from below.
- H. Size and Arrangements
 - 1. Panel dimensions and general instrument arrangement shall be as indicated on the Drawings or in the attached equipment schedules.
- I. Interior Lighting
 - 1. Illumination of panel interiors shall be provided by ceiling mounted lamp fixtures spaced at approximately 2'-6" [760 mm] and near the door. Fixtures shall be nominal 5-watt LED type and provided with a corresponding door switch to allow the lights to energize when the respective door is held open. Duplex-grounded receptacles shall be provided for service and maintenance tools at spacing not greater than 5 feet [1.52 m] throughout the length of a panel. The lighting and receptacle circuit shall be fused separately from the instrumentation systems.
- J. Laptop Shelf
 - 1. Free-standing control panels shall be provided with a cantilevered fold-down shelf designed for a laptop computer to set on. The shelf shall be permanently affixed to the interior of the panel door(s). Shelf height should be suitable for standing height. Laptop shelf shall be Hoffman or equal.

2.03 WALL-MOUNTED CABINETS

- A. Cabinets, which contain the system components indicated on the Drawings, shall be suitable for wall or strut mounting and shall meet the NEMA enclosure rating as indicated on the Drawings or, if applicable, in the attached equipment schedules or the referring equipment specification section. The enclosures shall be fabricated from USS 14 gage [1.9 mm thick], or heavier, carbon steel, stainless steel, or fiberglass. Cabinets shall be equipped with full size gasketed doors with hinges and a chromium-plated or stainless steel three-point latch the door shall be lockable with a key and provided with a hasp for accommodating a padlock.
- B. Floor stands shall be provided to support cabinets not fastened to a wall or other support. Floor stands shall be full-depth and shall have a minimum height of 12 inches. Floor stand material and finish shall match the cabinet.
- C. All wall-mounted cabinets shall meet the requirements of the panel fabrication paragraph of this section.
- D. Outdoor cabinets shall be provided with sunshades as indicated on the Drawings or, if applicable, in the attached equipment schedules or the referring equipment specification section.

2.04 DATA SERVER ENCLOSURES

- A. An enclosed equipment distribution rack shall be provided for mounting network equipment provided as rack-mounted, including switches, firewalls, routers, and patch panels. The rack shall be black painted steel or painted aluminum construction with fully tapped, standard 18.3 inch hole-to-hole centers and shall include all hardware and accessories including frame, shelves, and raceways as specified and as shown on Drawings. Rack enclosures shall be as manufactured by Amco Engineering, Hoffman, or equal.
- B. Data server enclosures shall include lockable front and rear access doors.
- C. Each data server enclosure shall be furnished with a rack-mounted uninterruptible power supply (UPS) to provide backup power to all enclosed loads. Rack-mounted UPSs are specified elsewhere in this section.
- D. Each data server enclosure shall be furnished with a rack-mountable keyboard, video, and mouse (KVM) console that provides secure access to the rack-mounted hardware. The KVM console shall include at a minimum, a retractable LCD monitor and keyboard and front panel computer selection. KVM consoles shall be TAA Compliant 8-Port 17" LCD Combo KVM Switch or equivalent.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Installation requirements are specified in the Instrumentation and Control System section. In addition, equipment furnished under this section shall conform to the following manufacturing stipulations.
- B. Piping
 - 1. All tubing shall be run in horizontal and vertical planes and shall be rigidly supported to withstand handling and shipment. Flexible polyethylene tubing shall be used to connect devices mounted on hinged doors.
- C. Wiring
 - 1. All wiring shall be grouped or cabled and firmly supported inside the panel. Wiring shall be bundled in groups and routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.
- D. More Than One Panel
 - 1. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic Drawings.

END OF SECTION

13570-S01 – FREESTANDING VERTICAL PANEL SCHEDULE

2.010	Tag Number/Panel ID	P667PMPPLCCP01
2.020	NEMA Enclosure Rating	
	12	
	4	
	4X	X
2.030	Materials of construction	
	Carbon steel	
	316 Stainless steel	X
	Fiberglass polyester	
2.040	Environmental provisions	
	Sunshade and drip shield	
	Cooling fan	
	Air conditioner	
2.050	Door Arrangements	
	Hinged rear doors	
	Hinged front door with instruments	
	Hinged front door without instruments	X
	Fixed front	
	Recessed base	
2.060	Dimensions (min. H x W x D) ¹	72"x24"x18"
2.070	Panel interior-mounted UPS	X
2.080	Conduit entrance	
	Bottom open	X
	Removable top plates	
3.000	Exceptions, Clarifications, and Comments	
3.010	Legs required to mount panel above grade	X
3.020		

¹ Listed panel depth is a minimum.

END OF SCHEDULE

13570-S01 – Freestanding Vertical Panel Schedule

13570-S02 – WALL-MOUNTED CABINET SCHEDULE

2.010	Tag Number/Panel ID	P619PMPRADIOCP01 P646PMPFPPCP01 P663PMPFPPCP01 P664PMPFPPCP01 P686PMPFPPCP01 P697PMPFPPCP01	P623PMPRADIOCP01 P676PMPFPPCP01 P699PMPRADIOCP01 P745PMPPLCCP01	P603PMPPLCCP01 P637PMPPLCCP01	P606PMPPLCCP01 P607PMPPLCCP01 P608PMPPLCCP01 P611PMPPLCCP01 P612PMPPLCCP01
2.020	NEMA Enclosure Rating				
	12				
	3R				
	4				
	4X	X	X	X	X
2.030	Materials of construction				
	Carbon steel				
	316 Stainless steel	X	X	X	X
	Fiberglass polyester				
2.040	Environmental provisions				
	Sun shade	X			
	Cooling fan				
	Air conditioner				
	Heater	X	X	X	X
2.050	Dimensions (min. H x W x D) ¹	36"x30"x16"	36"x30"x16"	48"x24"x18"	48"x36"x16"
3.000	Exceptions, Clarifications, and Comments				
3.010	None				

¹ Listed panel depth is a minimum.

END OF SCHEDULE

13570-S03 – NETWORK RACK SCHEDULE

2.010	Tag Number/Panel ID	P711NETCP01
2.020	Rack Features	
	Open Frame	
	Enclosed	X
	Wall Mounted	X
	Floor Mounted	
	Doors with Windows	
2.030	Materials	
	Carbon steel	X
	Stainless steel	
	Fiberglass polyester	
2.040	Optional Accessories	
	Internal UPS	X
	Vertical Cable Management	X
	Horizontal Cable Management	
	Light	X
	Power Distribution Unit	X
3.000	Exceptions, Clarifications, and Comments	
	Exterior dimensions (H x W x D), minimum	25"x23.5"x25.5"

END OF SCHEDULE

SECTION 13590 – PROCESS CONTROL NETWORK SYSTEMS

PART 1 – GENERAL

1.01 SCOPE

- A. The Network Systems section covers the furnishing of all hardware and software for process control network systems for the Instrumentation and Control System. Principal components of the network systems shall be as indicated on the Network Control Block Diagrams and as described below.
- B. System Supplier shall furnish all necessary network equipment, interconnecting cables, accessories, software, and appurtenances for proper network operation and to meet the functional requirements indicated on the Drawings and specified herein. Configuration of all hardware shall be provided by the System Supplier.
- C. Equipment and services provided under the Network Systems section shall be subject to the general requirements specified in the Instrumentation and Control System section. Supplementing this section, network data, special requirements, and options may be indicated on the Drawings listed above.
- D. Control System
 - 1. The Instrumentation and Control System section shall apply to all systems described herein. All applicable requirements specified in the Instrumentation and Control System section shall apply to equipment and services provided herein.
- E. Network Functional Description
 - 1. The process control network system shall provide communications between the operator workstations, servers, network switches, fire walls, routers, and PLCs.

1.02 GENERAL

- A. System Supplier shall select the process control network equipment for its superior quality and the intended performance. The System Supplier shall install all equipment in accordance with the manufacturer's instructions. Equipment and materials used shall be subject to review and shall comply with the following requirements.
- B. General Equipment Stipulations
 - 1. The General Equipment Stipulations shall apply to all equipment and materials provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.
- C. Drawings
 - 1. Supplementing this section, the Drawings indicate locations and arrangement of hardware and enclosures, provide mounting details, and may show other information regarding the connection and interaction with other equipment.
- D. Governing Standards

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1. Governing Standards for process control network systems shall be as specified in the Instrumentation and Control System section.
- E. Power and Instrument Signals
 1. Unless otherwise specified, electric power supply to the network equipment will be unregulated 24 volts dc or 120 volts ac. Where shown, network equipment shall be provided with backup power such as an uninterruptible power supply.
- F. Appurtenances
 1. Special or manufacturer specific power supplies, special cable, special grounding, and isolation devices shall be furnished for proper performance of the equipment.
- G. Interchangeability and Appearance
 1. To the extent possible, components used for similar types of functions and services shall be the same brand and model line. Similar components of different network hardware shall be the products of the same manufacturer to facilitate maintenance and stocking of spare parts. Whenever possible, identical units shall be furnished.
- H. Programming Software
 1. Software required for programming, shall be provided for systems that contain any equipment that requires software for routine maintenance and troubleshooting. The programming software shall be the latest version offered by the manufacturer, compatible with the equipment provided, and newly purchased for this project. Programming software shall be turned over to Owner at completion of startup. Programming software shall be licensed to the Owner.

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Instrumentation and Control System section and as listed below.
- B. The submittals shall include the following items for the Network Design submittal (to be provided with the First Stage Submittals):
 1. A complete process control network topology diagram, detailing all hardware, cabling and the interconnections between all connected equipment. Interconnections to existing installed equipment and Owner-furnished equipment shall be included in the diagram.
 2. A complete listing of IP addresses to be assigned to all network and network connected equipment furnished under this contract shall be provided. The assignment of IP addresses shall be coordinated with the Owner. Failure to provide this equipment IP addresses list with the First Stage Submittals could cause the submittal to be returned as unreviewed or rejected outright.
- C. All above documentation shall also be provided in the O&M manuals. The Ethernet Network Test reports described herein shall be provided with the Third

Stage O&M submittals. Failure to provide the Ethernet Network Test reports with the Third Stage O&M submittals could cause the submittal to be returned as unreviewed or rejected outright.

1.04 DELIVERY, SHIPMENT, PROTECTION, AND STORAGE

- A. Equipment provided under this section shall be shipped, protected, and stored as specified in the Instrumentation and Control System section. Identification of packaging shall be as described in the Instrumentation and Control System section.

1.05 CONNECTION TO EXISTING OWNER NETWORKS

- A. Network hardware and software provided shall be compatible with the Owner's existing process control network systems wherever a system interconnection is provided. System Supplier shall verify existing process control systems to ensure compatibility.
- B. All connections to the Owner's existing network shall be fully coordinated between the Owner and the System Supplier. Prior to connecting to the existing network, the System Supplier shall provide a written request to the Owner for an Owner's representative to be available, along with facility approval as described below when existing systems are disconnected and at the time of any new connections.

1.06 COORDINATION WITH OWNER

- A. The System Supplier shall coordinate all demolitions, installations and rework on the existing networks with the Owner and the Engineer. No work shall be performed without the written consent of the Owner. The System Supplier shall submit a written request to perform work on the existing network, including date, time, scope of work, length of time, and any Owner's support that may be required.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The following paragraphs provide minimum process control Ethernet network device stipulations.

2.02 NETWORK CABLING SPECIFICATIONS

- A. Individual network equipment and related devices shall be coordinated with items provided in the Metallic Communication Cables and Connectors section and the Fiber Optic Communication Cables and Connectors section.

2.03 ETHERNET NETWORK HARDWARE

- A. Ethernet network hardware shall be provided as specified and/or as shown on the Drawings. All specified functionality of provided Ethernet network equipment shall adhere to the IEEE 802.3 and 802.3u standards using copper wire or fiber

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optic strands. Ethernet network switches shall support ring, bus, tree, or point-to-point network topologies. On-line signal monitoring shall be provided to detect and locate impending faults. Ethernet network switches shall be replaceable on-line without disrupting the network. Redundant Ethernet switches shall be provided where shown on the Drawings. Ethernet switches shall be provided to connect multiple network segments together, selectively forwarding traffic between the segments.

B. Rack-Mounted Ethernet Switches

1. Each rack-mounted Ethernet network switch shall include the following functionality:
 - a. Switches shall support the quantity of 10/100/1000BaseTX ports and 10BaseFL/100BaseFX/1000BaseLX Fiber ports to meet the connectivity and functionality indicated in this specification and as shown on the Drawings. Switches shall be provided with a minimum of 10/100/1000Base-T, RJ-45 ports. A minimum of 16 ports shall be provided that includes at least 20% spare ports for the installed system. When fiber optic cable is connected to an Ethernet switch, a minimum of four (4) 100/1000Base-FX, multimode or single mode fiber optic cable LC ports with SFP modules (or built in) shall be provided. Total number of copper and fiber ports shall be as indicated in this specification and as shown on the Drawings.
 - b. Each switch connection shall automatically sense the network speed of the devices to which it is connected.
 - c. Path Redundancy: IEEE 802.1w Rapid Spanning Tree Protocol.
 - d. Prioritization: IEEE 802.1p QoS Support.
 - e. Support for Optional Redundant Power Supply as required on Drawings.
 - f. Management: Fully Managed Switch with support for SNMP v.3., and port mirroring. All unused ports shall be disabled using the Ethernet switch programming software.
 - g. All necessary memory upgrades, software feature sets, and cables needed for proper operation of these switches shall be furnished with each switch.
 - h. Environmental: Suitable for installation in industrial environments.
 - (i) Operating Temperature Range: 0 to 60°C
 - (ii) Operating Relative Humidity Range: 10 to 95%
 - i. Mounting: 19-inch rack mount
 - j. Connectivity: Provide copper and fiber patch panel as shown on the Drawings.
2. Power over Ethernet (POE) switches shall have the following functionality:
 - a. Power Enabling and standards: IEEE 812.3af.
 - b. Power: 48 VDC, 50 watt minimum power supply for power enabling switch.
 - c. LED indication of the link activity for each port and power forwarding.

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3. Rack-mount industrial ethernet switches as shown on the Drawings shall be Allen Bradley 5410 series Industrial Distribution Switches without exception. Rack-mount industrial ethernet switches shall be configured to be Layer 3 or Layer 2 models as shown on the Drawings.
- C. Industrial (Panel-Mounted) Ethernet Switches
1. Managed Ethernet Switches
 - a. Each Ethernet switch mounted in a process area enclosure shall include the following functionality:
 - (i) Ports: Switch shall support the quantity of 10/100BaseTX ports and 100BaseFX fiber ports to meet the connectivity and functionality indicated on the Drawings, with a minimum of 20% spare auto-negotiating 10/100Base-T, RJ-45 ports, and two (2) single mode LC fiber uplink ports. SFP modules shall be provided as required. A minimum of four UTP ports shall be provided.
 - (ii) Layer 3 Ethernet switches connecting to the fiber backbone shall include two single mode bidirectional SFPs capable of 1000 Mbps over 10 km, Cisco Model GLC-BX-U.
 - (iii) Each switch connection shall automatically sense the network speed of the devices to which it is connected.
 - (iv) Capable of ring-based media redundancy with 30 ms recovery time.
 - (v) Path Redundancy: IEEE 802.1w Rapid Spanning Tree Protocol.
 - (vi) Prioritization: IEEE 802.1p QoS Support.
 - (vii) Network Segregation: Port VLAN.
 - (viii) Management: SNMPv3 and Browser-based management shall be supported.
 - (ix) IGMP snooping supported.
 - (x) LED indication of the link activity for each port.
 - (xi) Environmental: Suitable for installation in industrial environments.
 1. Operating Temperature Range: -10 to 60°C.
 2. Relative Humidity Range: 10 to 95%
 - (xii) Redundant 24 VDC power supply inputs.
 - (xiii) Conformal coating option for use in hazardous environments.
 - (xiv) Mounting: DIN-rail mounted suitable for panel installation.
 - (xv) All necessary memory upgrades, software feature sets, and cables needed for proper operation of these switches shall be furnished with each switch.
 - b. Power over Ethernet (POE) switches shall have the following functionality:
 - c. Power Enabling and standards: IEEE 812.3af.
 - d. LED indication of the link activity for each port and power forwarding.
 - e. Switches shall be Allen Bradley Stratix series or approved equal. Switches shall be furnished with POE injector(s) as shown on the 13590 –Process Control Network Systems

Drawings. Layer 2 switches as shown on the Drawings shall be Allen Bradley Stratix 5200 series without exception. Layer 3 switches as shown on the Drawings shall be Allen Bradley Stratix 5400 series without exception.

2. Unmanaged Ethernet Switches

- a. Each unmanaged Ethernet switch mounted in a process area enclosure shall include the following functionality:
 - (i) Ports: Switch shall support the quantity of 10/100Base TX ports and 100BaseFX fiber ports to meet the functionality indicated on the Drawings, with a minimum of 20% spare auto-negotiating 10/100Base-T, RJ-45 ports. SFP modules shall be provided when required. A minimum of four UTP ports shall be provided.
 - (ii) Each switch connection shall automatically sense the network speed of the devices to which it is connected.
 - (iii) Path Redundancy: IEEE 802.1w Rapid Spanning Tree Protocol.
 - (iv) LED indication of the link activity for each port.
 - (v) Environmental: Suitable for installation in industrial environments.
 1. Operating Temperature Range: -10 to 60 C.
 2. Relative Humidity: 10 to 95%.
 - (vi) Redundant 24 VDC power supply input where shown on the Drawings.
 - (vii) Conformal coating option for use in hazardous environments.
 - (viii) Mounting: DIN-rail mounted suitable for panel installation.
 - (ix) All necessary memory upgrades, software feature sets, and cables needed for proper operation of these switches shall be furnished with each switch.
- b. Unmanaged switches shall be Phoenix Contact “FL Switch 1000/1100 series”, Hirschmann “Spider series”, Red Lion N-Tron “series 1000”, or approved equal.

D. Security Appliances

1. Security appliances shall be provided to allow connection of a Wide Area Network (WAN) to the Local Area Network (LAN). The security appliance shall limit incoming and outgoing network traffic to specific IP addresses.
 - a. LAN Connection: 5-10/100 Base-T Ethernet Port.
 - b. WAN Connection: At least 2 WAN slots.
 - c. Management: Browser based, and SNMP v2 or v3.
 - d. VLAN Support.
2. Security appliances shall be Fortinet FGR-70F or approved equal.

E. Network Firewall

1. Network firewall hardware shall be a dedicated hardware device and provide security and isolation between networks. Network firewalls shall be provided

where shown on the Drawings or specified herein. Firewalls shall have the following functionality:

- a. Stateful Packet Inspection (SPI), Deep Packet Inspection (DPI), and Filtering.
 - b. DHCP and Network Address Translation Services.
 - c. Virtual private networking (VPN) support.
 - d. A minimum of three dedicated or configurable DMZ port.
 - e. A minimum of five integrated 10/100Base-T ports.
 - f. Management: Browser based, and SNMP v2 or v3.
 - g. Logging of all access through the firewall.
 - h. 19-inch rack mounting, where required for proper installation.
 - i. Network firewalls shall operate on 120 VAC and be provided with backup power.
2. Firewalls shall be Cisco Firepower 1000 series, Hirschmann Eagle40-07, or approved equal. Firewall capability can be provided with a router, provided the above functionality is provided.
- F. Ethernet Connectors
1. Ethernet wiring connectors shall be RJ-45 male modular plug connectors.
 2. Standard RJ45 Connectors
 - a. Standard connectors shall be polycarbonate, clear connectors. Connectors shall conform to RJ-45 and ISO 8877 standards. Contacts shall be gold plated with a 0.5A current rating and a -25° to 60° C temperature rating. Connectors shall accept unshielded Cat-5e or Cat-6, AWG 24, solid conductor cable.
 3. Industrial RJ45 Connectors
 - a. Industrial connectors shall be an eight position industrial connector for use in manufacturing environments. Connectors shall meet the TIA/EIA-568-B.2 standard for Cat-5e or Cat-6 requirements. The connector shall incorporate an IP67 rated seal and shall provide protection from dust and temporary immersion in water. A tethered protective cap shall be provided. The connector shall accept a non-shielded Cat-5e or Cat-6 solid twisted pair cable. Connectors shall be Panduit, Belden, or approved equal.
 4. Industrial RJ45 Receptacles
 - a. Industrial receptacles shall be an eight position industrial, panel mounted pass through receptacle. Receptacles shall meet the TIA/EIA-568-B.2 standard for Cat-5e or Cat-6 requirements. The receptacle shall incorporate an IP67 rated seal and shall provide protection from dust and temporary immersion in water. A tethered protective cap shall be provided. The receptacle shall accept a non-shielded Cat-5e or Cat-6 solid twisted pair cable. Receptacles shall be Panduit, Belden, or approved equal.

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G. Media Converters

1. The System Supplier shall supply fiber optic media converters for all systems requiring conversion from copper media to fiber optic media. All converters shall be mounted in the network panels or process control enclosures. The System Supplier shall coordinate the media converter and termination requirements with the fiber optic cable and network protocols. Media converters shall operate on 120 Vac or 24 Vdc as shown on the Drawings and be provided with backup power.
2. Fiber to Copper Converters
 - a. Fiber optic to copper media converters for all computer networks shall convert twisted pair 10/100BaseT cable transmissions to 10/100BaseFX fiber optic cable transmissions. Converters shall provide auto-sensing detection of network speed and full duplex or half duplex signaling. Converters shall have diagnostic LEDs for network speed and network traffic. Converter copper port shall be 100BaseTX (RJ-45). Converter fiber port shall be compatible with connectors provided with fiber cable jumpers and compatible with fiber cable type and light wavelength. Transmission Speed shall be 100Mbps on both ports. The converter shall be powered from 120 volts ac, or shall be provided with a plug-in transformer to provide the required voltage to the device. Converters shall be provided with backup power. Converters shall be [DIN rail] [19-inch rack] mounted in network panels or process control enclosures. Converters shall be as manufactured by Lantronix, D-Link, Black Box, Hirschmann, or approved equal.

2.04 SPARE PARTS

A. Spare parts shall be provided as specified below:

<u>Spart Parts</u>	<u>Quantity</u>
Switches	1 of each type
Security Appliances	1 of each type
Firewalls	1 of each type
Media Converters	1 of each type

PART 3 – EXECUTION

3.01 NETWORK INSTALLATION REQUIREMENTS

A. Additional network installation requirements are specified in the Instrumentation and Control System section. Networks shall be installed and tested in accordance with the following requirements.

3.02 NETWORK CONFIGURATION

- A. The System Supplier shall fully configure all network devices. All device selections shall be fully coordinated with the Owner to ensure compatibility with existing systems and standards.
- B. Ethernet Switches
 - 1. The System Supplier shall fully configure all Ethernet switches. The following shall be configured:
 - a. For managed switches, unused ports shall be disabled for security purposes during the switch configuration via settings or software selection.
 - b. Spanning Tree or other appropriate redundancy scheme shall be configured for all redundant links. Trunking or other bandwidth sharing redundancy schemes shall be utilized where available to minimize switching times and increase available bandwidth.
 - c. Management Password Security in accordance with the Owner’s cyber security policy.
 - d. Quality of Service, with any traffic to/from PLCs getting priority over all other traffic.
 - e. VLAN/subnet network segmentation.
- C. Firewalls
 - 1. The System Supplier shall fully configure all network firewalls. The firewall shall be configured for all network connections provided under this contract and shall be configured to exclude devices not part of the control system network unless otherwise specified. The firewall shall be configured to deny all traffic, except for traffic specifically allowed in the ruleset.
- D. Network Configuration Report
 - 1. The System Supplier shall provide a configuration report to the Owner detailing all connections, addresses, and port assignments.
- E. Management Software
 - 1. Management software shall be fully configured for all network devices provided.

3.03 NETWORK TESTING

- A. After each network has been installed, a technical representative of System Supplier shall test the network and shall provide a written report for each test. Specific testing requirements are described in the individual network specification sections.
- B. Systems Check
 - 1. A technical representative of System Supplier shall participate in the checkout of network systems. Systems check requirements shall be as specified in the Instrumentation and Control System section.
 - 2. Test Equipment
 - a. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by System Supplier for

the duration of the testing work and this test equipment will remain the property of System Supplier.

3. Ethernet Network Minimum Test Requirements

a. The following minimum tests are to be performed by the System Supplier:

- (i) Verify Link Integrity Status LED is lit on both sides of each link. Refer to product manuals to confirm the LED status indication for each network interface card or network device.
- (ii) Verify proper operation and failover of each redundant component and redundant link. Each redundant server, PLC, or other network hardware device shall be powered down or disconnected from the network to verify that the other device successfully takes control, and all functionality exists. For redundant network connections, each network connection shall be disconnected to verify that there is no loss of communication on the network.
- (iii) Verify alarming of each link failure. Network failure alarms shall be configured within the network interface card software or other network device configuration software. For PLC communication, communication heartbeats shall be configured to detect a loss of communication, and alarms shall be configured when the heartbeat is not received. The generation of a communication alarm shall be confirmed for each network device.
- (iv) Verify bandwidth usage of fully installed systems as part of the Operation Acceptance Testing as specified in the Commissioning section. The analysis of the network utilization and bandwidth usage shall be performed using SolarWinds NetFlow Traffic Analyzer or equivalent. Any concerns identified from the analysis shall be clearly identified with the recommended corrective actions.

C. Ethernet Network Test Reports

- 1. Upon completion and testing of the installed Ethernet network, the System Supplier shall submit test reports to the Engineer in printed form. Test reports are to show all test results performed by the System Supplier for each port and piece of equipment. Date of calibration of the test equipment is also to be provided.

3.04 NETWORK TROUBLESHOOTING

- A. It is the System Supplier's responsibility to provide trouble-free and reliable networks. The System Supplier shall employ any means necessary to ensure operational networks. The System Supplier shall obtain any needed test equipment, including but not limited to time-domain reflectometers, protocol analyzers and network sniffers, to troubleshoot any problems. The System Supplier shall utilize the services of a trained and certified Network Engineer that is regularly involved in troubleshooting network problems, in the event that

operational or reliability problems exist. Acceptable certifications include Cisco CCNP, Cisco CCIE, or Network Professional Association Certified Network Professional (CNP).

3.05 TRAINING

- A. Training for networks is covered under Network Training in the Instrumentation and Control System section.

END OF SECTION

SECTION 13591 – METALLIC AND FIBER OPTIC COMMUNICATION CABLES AND CONNECTORS

PART 1 – GENERAL

1.01 SCOPE

- A. The Metallic and Fiber Optic Communications Cable and Connectors section covers the furnishing and installation of cable systems to provide communications for the Instrumentation and Control System as indicated on the Drawings.
- B. Accessories and appurtenances shall be provided as specified herein to provide a complete and properly operating system.
- C. Equipment and services provided under this section shall be subject to the General Computer Control System Requirements specified in the Instrumentation and Control System Section and the Process Control Network Systems section. Supplementing the Metallic and Fiber Optic Communications Cable and Connectors section, network data, special requirements, and options are indicated on the Drawings.

1.02 SUBMITTALS

- A. Submittals shall be made as specified in the Instrumentation and Control System section.
- B. Qualifications
 - 1. The name, address and telephone number of the proposed contractor or subcontractor, including specific personnel to perform the work shall be included with the submittals. Provide the experience record of the subcontractor and personnel in performing work similar to that specified. Include the agency, contact person, and telephone number of at least three (3) previous network installation projects completed by the proposed subcontractor. The Engineer shall review and approve the network installation subcontractor and personnel prior to any of the related work being performed. This review will be conducted during the project submittal phase, as described below.
- C. Drawings and Data
 - 1. All material and equipment documentation shall be submitted for review in accordance with the Submittals section. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment.
 - 2. Product data shall include the following in the Submittals section:
 - a. Cut sheets and catalog literature for proposed fiber optic cable, and fiber optic cable accessories (pigtails, connectors, etc.)
 - b. Manufacturer specifications and data that clearly shows that the fiber optic cable meets all requirement specified herein.
 - c. Sample of the proposed cable.
 - d. Physical dimension drawings of all fiber optic accessories.

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- e. Proposed fiber identification sequence and labeling.
 - f. Provide off-line maintenance aids and on-line diagnostics to check the performance of the communication links and interfaces of devices on the data highway.
 - g. Provide a Recommended Spare Parts List (RSPL).
 - h. Provide a list of recommended special tools for fiber installation testing or maintenance.
- D. Operations and Maintenance Manuals
- 1. Operation and Maintenance Manuals shall have the following items included in addition to those items specified in other sections:
 - a. Description of all components.
 - b. Methods of connection.
 - c. Connection diagram.
 - d. OTDR trace plots for all fibers.

1.03 SHIPMENT, PROTECTION, AND STORAGE

- A. Equipment provided under this section shall be shipped, protected, and stored in accordance with the requirements of the Instrumentation and Control System section.

1.04 QUALIFICATIONS

- A. Due to the specialized nature of installing, splicing, terminating, and testing optical fiber cable, the Contractor shall utilize personnel who are experienced in such practices. The installing Contractor or Subcontractor shall have performed similar installation and testing work on at least three projects of similar size and complexity. The personnel assigned to the installation and testing shall also have experience on at least three projects of similar size and complexity.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All fiber optic cable, fiber optic hardware and accessories shall be designed, assembled and connected in accordance with the requirements of these Specifications and the Drawings.

2.02 ETHERNET UNSHEILDED TWISTED PAIR (UTP) CABLE

- A. Ethernet cables and connectors shall be provided for a complete and working system, and/or as shown on the Drawings. Cable for Ethernet wiring shall be UTP Cat-6 cable. Jacket color coding for cables shall be as follows:
 - 1. Standard Cat-6 – Yellow
 - 2. Crossover Cables – Red
- B. Category 6 UTP Cable
 - 1. Cat-6 cable shall meet the following requirements:
 - a. 24 AWG

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- b. 4 pair solid strand FEP Teflon insulation
 - c. 100 Ohm impedance
 - d. 1-250 MHz frequency range
 - e. Min attenuation 19.9dB
 - f. 100 Ohm impedance
 - g. Min NEXT 44.3dB/100MHz
 - h. Min PS-NEXT 42.3dB/100MHz
 - i. Min ELFEXT 27.8dB/100MHz
 - j. Min PS-ELFEXT 24.8dB/100MHz
 - k. Min return loss 20.1 dB/100 MHz
 - l. Max delay skew 45 ns
 - m. Max propagation delay 540 ns
2. Plenum rated cable shall have FEP insulation jacketing and FEP insulation for conductors. Non plenum rated cable shall have PVC insulation jacketing and polyethylene insulation for conductors. Cat-6 cable shall be Belden 1872 or equal.
- C. Ethernet Patch Cables
1. Pre-wired and terminated patch cables with RJ-45 connectors and lever protecting boot shall be furnished for all connections to computers, network equipment, and controller equipment except where physical conditions (i.e. length over 12 ft. or conduit size) require unterminated wire to be installed. Patch cables shall be Cat-5e for networks speeds up to 100 MHz, and Cat-6 for networks speeds greater than 100 MHz and shall meet the requirements of Cat-6 cable specified in this section. Straight through cables shall be wired using the T568-B standard for both connectors. Crossover cables shall be wired using the T568-A standard for one connector and the T568-B standard for the opposite end.

2.03 FIBER OPTIC CABLE

- A. The fiber optic cable must meet all of the requirements of the following paragraphs:
- 1. The fiber optic cable must meet the following requirements of the National Electrical Code (NEC) Section 770.
 - 2. Riser Applications – Applicable Flame Test UL 1666.
 - 3. Finished cables shall conform to the applicable performance requirements of Table 8-6 and 8-7 in the Insulated Cable Engineers Association, Inc. (ICEA) Standard for Fiber Optic Premises Distribution Cable (ICEA S-83-596).
 - 4. Every fiber in the cable must be usable and meet required specifications.
 - 5. All optical fibers shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.

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6. Each optical fiber shall consist of a doped silica core surrounded by a concentric glass cladding. The fiber shall be a matched clad design.
7. All optical fibers shall be proof tested by the fiber manufacturer at a minimum load of 100 kpsi.
8. All optical fibers shall be 100 percent attenuation tested. The attenuation shall be measured at 1310 nm and 1550 nm for single-mode fibers. The attenuation shall be measured at 850 nm and 1300 nm for multimode fibers. The manufacturer shall store these values for a minimum of 5 years. These values shall be available upon request and provided in submittals described in the paragraphs above.
9. The storage temperature range for the cable on the original shipping reel shall be -40°C to $+70^{\circ}\text{C}$. The operating temperature range shall be -40°C to $+70^{\circ}\text{C}$. Testing shall be in accordance with FOTP-3.
10. The attenuation specification shall be a maximum attenuation for each fiber at $23 \pm 5^{\circ}\text{C}$.
11. The attenuation of the cabled fiber shall be uniformly distributed throughout its length such that there are no discontinuities greater than 0.10 dB at either 1310 nm or 1550 nm (single-mode) in any one kilometer length of fiber. For multimode, there shall be no discontinuities greater than 0.2 dB at 850nm/1300nm in any one kilometer length of fiber.
12. Required Fiber Grade:
 - a. Single-mode: Maximum Fiber Attenuation at 1383 ± 3 nm shall not exceed 2.1 dB/km.
 - b. Multimode: Maximum Fiber Attenuation at 850 nm shall be 3.5 dB/km.
13. Optical fibers shall be placed inside a loose buffer tube. The nominal outer diameter of the buffer tube shall be 2.5 mm.
14. The cable shall contain 96 fibers unless noted otherwise on the Drawings. Each buffer tube shall contain up to 12 fibers.
15. The fibers shall not adhere to the inside of the buffer tube.
16. Each fiber shall be distinguishable from others by means of color coding in accordance with TIA/EIA-598-A, "Optical Fiber Cable Color Coding."
17. The fibers shall be colored with ultraviolet (UV) curable inks.
18. Buffer tubes containing fibers shall also be color coded with distinct and recognizable colors in accordance with TIA/EIA-598-A, "Optical Fiber Cable Color Coding."
19. In buffer tubes containing multiple fibers, the colors shall be stable during temperature cycling and not subject to fading or smearing onto each other. Colors shall not cause fibers to stick together.
20. The buffer tubes shall be resistant to kinking.
21. The cable jacket color shall be black.
22. Fibers may be included in the cable core to lend symmetry to the cable cross-section where needed. Fibers shall be placed so that they do not interrupt the

consecutive positions of the buffer tubes. In dual layer cables, any fillers shall be placed in the inner layer. Fillers shall be nominally 3.0 mm in outer diameter.

23. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness; jackets extruded under high pressure are not acceptable. The jacket shall be smooth, as consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.
 24. The outer cable jacket shall be marked with the manufacturer's name or UL file number, date of manufacture, fiber type, flame rating, UL symbol, and sequential length markings every four feet (e.g. "OS2 SINGLEMODE – TYPE OFNR – (UL) 00001 Feet"). "City of KCMO Fiber 816-301-6260" shall also be imprinted on the cable along the entire length every four feet. The print color shall be white.
 25. The cable shall be all-dielectric.
 26. The cable shall be gel-free.
 27. Flammability – All cables shall comply with the requirements of the 1996 NEC Article 770. All cables shall pass UL 1666.
- B. Fiber optic cable shall be Corning Cable Systems "ALTOS Gel-Free Double-Jacket, Dielectric Cable" series without exception.
- C. Single-mode Fiber Optic Cables
1. Single-mode fiber optic cable shall meet the following requirements:
 - a. The dispersion unshifted single-mode fiber utilized in the cable specified herein shall conform to the specifications herein.
 - b. Single-mode OS2.
 - c. Cladding diameter: $125.0 \pm 1.0 \mu\text{m}$.
 - d. Core-to-Cladding Offset: $< 0.8 \mu\text{m}$.
 - e. Cladding Non-Circularity: $< 1.0\%$.
 - f. Coating Diameter: $245 \pm 10 \mu\text{m}$.
 - g. Colored Fiber Diameter: nominal $900 \mu\text{m}$.
 - h. Attenuation Uniformity: No point discontinuity greater than 0.10 dB at either 1310 nm or 1550 nm.
 - i. Attenuation at the Water Peak: The attenuation at $1383 \pm 3 \text{ nm}$ shall not exceed 2.1 dB/km.
 - j. Cutoff Wavelength: The cabled fiber cutoff wavelength(λ_{ccf}) shall be $< 1260 \text{ nm}$.
 - k. Mode-Field Diameter: $9.30 \pm 0.50 \mu\text{m}$ at 1310 nm 10.50 ± 1.00 micrometers at 1550 nm.
 - l. Zero Dispersion Wavelength (λ_0): $1301.5 \text{ nm} < \lambda_0 < 1321.5 \text{ nm}$.
 - m. Zero Dispersion Slope (S_0): $< 0.092 \text{ ps}/(\text{nm}^2 \cdot \text{km})$.

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- n. Fiber Polarization Mode Dispersion (PMD): < 0.5 ps/(sq. km).
 - o. The fiber optic cable must meet the following requirements of the National Electrical Code (NEC) Section 770.
 - p. Riser Applications – Applicable Flame Test UL 1666.
2. Single-mode fiber optic cables with 96 fibers shall be Corning Cable Systems “ALTOS Gel-Free Double-Jacket, Dielectric Cable model number 096EUE-T4100D20” without exception.
- D. Hybrid Fiber Optic Cables
- 1. Hybrid fiber optic cables shall be furnished and installed in accordance with the requirements of these specifications and the Drawings. Hybrid cable shall be provided for applications as indicated on the Drawings. Hybrid fiber optic cabling shall meet the following requirements:
 - a. The cable shall contain 24 fibers total. The first 12 buffers in the TIA/EIA 598 color-coded tubes shall contain single-mode fiber strands and the remaining 12 buffers shall contain multimode fiber strands.
 - b. The single-mode shall meet the requirements listed herein.
 - c. Multimode fiber shall only be provided as a means to interface with the Owner’s existing network communication cabling and shall be compatible with the existing cabling and/or network hardware.
 - 2. Multimode fiber provided in hybrid fiber optic communications cabling shall be 62.5/125 μ m core diameter. 62.5/125 μ m core diameter multimode fiber optic cable shall meet the following requirements:
 - a. The multimode fiber utilized in the cable specified herein shall meet EIA/TIA-492AAAA-1989, “Detail Specification for 62.5 m Core Diameter/125 m Cladding Diameter Class Ia Multimode, Graded Index Optical Waveguide Fibers.” Core diameter: 62.5 ± 3.0 micrometers.
 - b. Cladding diameter: 125.0 ± 2.0 micrometers.
 - c. Core-to-Cladding Offset: ≤ 3.0 micrometers.
 - d. Cladding non-circularity: $\leq 2.0\%$. Defined as: $[1 - (\text{min. cladding dia.} + \text{max. cladding dia.})] \times 100$.
 - e. Core non-circularity: $\leq 6.0\%$. Defined as: $[1 - (\text{min. core dia.} + \text{max. core dia.})] \times 100$.
 - f. Coating Diameter: 245 ± 10 micrometers.
 - g. Graded index.
 - h. Numerical Aperture: 0.275 ± 0.015 .
 - i. Attenuation Uniformity: There shall be no point discontinuities greater than 0.2 dB at either 850 nm or 1300 nm.
 - j. Minimum Bandwidth Requirement shall be 160/500 MHz-km at 850/1300 nm.
- E. Fiber Optic Cable Connectors
- 1. All optical fibers shall be terminated with connectors that are LC type for singlemode cables and type ST for multimode cable.

2. Epoxy Connectors
 - a. Epoxy connectors shall be provided to terminate each fiber in the cable. Connector style, LC, or other, shall be coordinated with the patch panels and field devices that will interface directly with the cable. Connectors shall be compatible with the supplied cable. Connector loss shall be no greater than 0.3 dB. Loss measurement shall be performed at the time of splicing and documentation shall be furnished for each termination. Connectors shall be Corning Cable Systems Connectors, or equal.
- F. Fiber Optic Jumper Cables
 1. Fiber optic jumper cables shall be furnished and installed for equipment interfacing and between termination cabinets. The jumpers shall meet the following requirements.
 - a. The jumpers shall be OS2 singlemode unless noted otherwise on the Drawings. They shall be tight-buffered and be protected by Kevlar-type strength material.
 - b. The jumpers shall be supplied with connectors on each end. Connector types (ST, LC, etc.) shall be matched to the equipment provided. Jumpers shall be sized to provide a single connection between the fiber optic hardware being connected. ethernet cable test equipment
- G. One hand-held network cable tester that is compatible with the provided network cabling shall be provided. The cable tester shall check for open pairs, shorted pairs, crossed pairs, reversed pairs, and split pairs for faults up to 100 m. Tester shall be Black Box "Model SOHO Plus Tester", Fluke MicroScanner2 Pro, or equal.

2.04 FIBER OPTIC PATCH PANELS

- A. Fiber optic patch panels (as referred to as fiber termination cabinets) shall be furnished to terminate fibers at the fiber optic modules, and any other data highway attached equipment. The cabinets shall meet the following requirements:
 1. The patch panels shall be wall, rack, DIN-rail, or outdoor field mount type as indicated in the schedule attached to this section, having provisions for terminating multiple fiber optic cables. Splice trays, strain relief cable attachment points, fiber organizers and bend radius hardware shall be furnished with each termination cabinet.
 2. Panel size shall be suited to the number of fibers to be terminated within the cabinet as shown on the Drawings and the schedule attached to this section. Bayonet/flanged couplings shall be furnished and mounted to each fiber to be terminated.
 3. Fiber terminations shall be spliced to pigtail cables having connector types as specified herein. The pigtails shall be terminated in an orderly method.

- B. Rack mount fiber optic patch panels shall be Corning Cable systems “CCH series” or approved equal.
- C. Wall mount fiber optic patch panels shall be Corning Cable systems “WCH series” or approved equal.
- D. DIN-rail mount fiber optic patch panels shall be Corning Cable Systems “SMH series”, Black Box, RLH Industries “Slimline series”, or approved equal.
- E. Rugged field mount fiber distribution panels shall be factory terminated with the required length of fiber optic cabling as shown on the Drawings and meet the fiber requirements specified herein. Rugged field mount fiber optic distribution units shall be Fiber Connections Inc. “Gator Patch series” without exception.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. The System Supplier shall be responsible for the coordination of the installation of all cable furnished hereunder. The System Supplier shall be responsible for the termination of all cable furnished hereunder.
- B. Cable Damage
 - 1. If the cable becomes damaged during installation, the Contractor shall stop work and notify the Engineer immediately. The Owner and Engineer will decide whether to replace the entire reel of cable or to install a splice at the damaged section. If the Owner decides to replace the entire reel of cable, the Contractor shall begin the installation at the last designated splice point. The damaged cable between these points shall be removed, coiled, tagged, and given to the Owner. Installation of new cable to replace damaged cable shall not be a basis of extra payment or contract completion time. In addition to installation of the new cable, the Contractor shall reimburse the Owner for the entire cost of the replacement reel of cable. This cost will be withheld from the contract price. If the Owner decides to install a splice at the damaged point, and the cable is damaged a second time, the entire reel of damaged cable (and all subsequent damaged reels) shall be replaced with new reels at the Contractor’s expense.
- C. Ethernet Cable Installation
 - 1. Straight through cables shall be wired using the T568-B standard for both connectors as shown in the table below (connector pin numbers are left to right with the clip down). Crossover cables shall be wired using the T568-A standard for one connector and the T568B standard for the opposite end as shown in the table below.

Connector Pin	568A Wiring Conductor	568B Wiring Conductor
1	White/Green	White/Orange
2	Green	Orange

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3	White/Orange	White/Green
6	Orange	White/Blue
4	Blue	Blue
5	White/Blue	White/Blue
7	White/Brown	White/Brown
8	Brown	Brown

D. Fiber Optic Cable Installation

1. The cable manufacturer shall provide installation procedures and technical support concerning the items contained in this specification. Fiber optic cable installation shall meet the following requirements:
 - a. All fiber optic cable shall be installed, terminated, and tested by the System Supplier or his fiber subcontractor as specified above.
 - b. In pulling the cable, strain-release, or other tension limiting devices shall be used to limit the pull tension to less than 600 lbs.
 - c. Minimum bend radius restrictions shall be satisfied both during and after cable installation.
 - d. Horizontal, unsupported cable runs shall be supported at continuous distances of 5 feet or less.
 - e. All conduit and cabinet entrances shall be sealed with RTV or other re-enterrable sealant material to prevent ingress of water, dust or other foreign materials.
 - f. Cable routing within occupied office areas shall conform to Federal, State, and local electrical and fire codes.
 - g. Any non-terminating (field) splices shall be documented as to the physical location and cable meter mark (prior to stripping). Field splices shall be OTDR-tested and documented prior to final cable acceptance testing.
 - h. Fiber optic cables shall be installed in accordance with NECA 301-2004, Installing And Testing Fiber Optic Cables.

3.02 CABLE TESTING

- A. After the network cabling has been installed, each network cable shall be tested.
- B. Test Equipment
 1. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by System Supplier for the duration of the testing work and this test equipment will remain the property of System Supplier.
- C. Ethernet UTP Cable Testing
 1. The System Supplier shall utilize the previously specified test equipment, and additional tools as needed to validate the Ethernet UTP cable installation. All test equipment shall bear current calibration certification from a certified calibration laboratory, as appropriate.

2. The System Supplier shall provide test documentation that includes the cable number, total length of cable, a permanent hard copy, as well as a USB type A flash drive or CD copy of all traces.
 3. After connectors are installed the following tasks shall be performed:
 - a. Perform end-to-end testing on all installed cables from both ends of the cable. Test shall include cable system performance tests and confirm the absence of wiring errors. Each cable shall be tested for open pairs, shorted pairs, crossed pairs, reversed pairs and split pairs.
 - b. Submit a signed test report presenting the results of the cable testing.
 - c. Repair or replace any portions of the system not meeting ANSI/TIA/EIA standards for a Category 6 installation. Repaired sections shall be retested.
 4. A check off sheet shall be utilized, shall be signed by the technician testing the cables, and shall be submitted for approval. Any identified faults shall be corrected at no additional cost. Submit three (3) copies of all final documentation (including traces), using the approved test form, to the Owner upon successful completion of the testing.
- D. Fiber Optic Cable Testing
1. Test procedures and field test instruments shall comply with applicable requirements of TIA:
 - a. LIA Z136.2
 - b. TIA 455 78
 - c. TIA 455 133
 - d. TIA 526 7
 - e. TIA 526 14
 - f. TIA 586-C.0
 - g. TIA 568-C.1
 - h. TIA 568-C.3
 2. Acceptance testing of the data highway (fiber and electronic equipment) shall be conducted as a part of integrated system field testing, as specified elsewhere. Prior to such tests, however, the fiber optic cable shall be tested as specified herein.
 3. The System Supplier, or his fiber subcontractor, shall conduct fiber optic cable testing as specified below. All testing following field installation shall be witnessed by the Engineer. The Contractor shall bear the cost for field witnessed testing in accordance with the General Equipment Stipulations section. A test plan shall be submitted prior to the proposed test dates. The test plan and procedures shall be mutually agreed to prior to conducting the tests.
 4. Condition of fiber end face for each cable shall be verified.
 5. Each optical fiber of each fiber optic cable shall be OTDR (Optical Time Domain Reflectometer) tested on the reel at the factory, on the reel upon 13591 – Metallic and Fiber Optic Communication Cables and Connectors

arrival at the jobsite, and after installation and termination. For each fiber, an OTDR (Optical Time Domain Reflectometer) trace soft/hardcopy is required to be provided to the Owner and Engineer. OTDR traces shall be provided for each test (at the factory, on the reel at the job-site, and after installation). A 100 foot launch cable shall be spliced to each fiber for each fiber OTDR test, to ensure accurate results. This end-to-end trace shall be performed from BOTH ends of the fiber. Also for each fiber, an end-to-end power attenuation (insertion loss) test shall be performed. The attenuation test shall use a stabilized optical source and an optical power meter calibrated to the appropriate operating wavelength (1300 nm).

6. For each installed fiber, the power attenuation shall not exceed the following, tested from connector to connector at the respective patch panels:
 - a. $(0.0035)L + (0.25)N + 3.0$ dB
 - (i) L = The length of the fiber optic cable in meters.
 - (ii) N = the number of splices in the fiber.
 - b. Any fiber optic cables containing one or more fibers not meeting this performance will not be accepted by the Owner, and shall be repaired or replaced at no additional cost
7. Each fiber optic jumper cable shall be tested and must exhibit an end-to-end attenuation of less than 2.0 dB at 1300 nm. Any jumper exceeding this level shall be replaced at no additional cost to the owner. Any damaged cable still on the reel shall be returned to the manufacturer for replacement at no additional cost to the Owner.
8. All fiber cable testing shall be documented on pre-approved test forms. Three hard copies (3) copies and a copy on USB Type A flash drive or CD of all documentation (including OTDR traces) shall be submitted to the Engineer and Owner upon successful completion of the testing.

END OF SECTION

13591-S01 FIBER OPTIC PATCH PANEL SCHEDULE

2.010 Tag Number/ Panel ID	2.020 Patch Port Count (Minimum)	2.020 Mounting Type		
		Rack Mount	Wall Mount	Din-Rail Mount
P600FPP01	12			X
P601FPP01	12			X
P604FPP01	12		X	
P606FPP01	12		X	
P607FPP01	12		X	
P609FPP01	12		X	
P612FPP01	12		X	
P614FPP01	12			X
P637FPP01	12			X
P646FPP01	12			X
P659FPP01	12		X	
P663FPP01	12			X
P664FPP01	12			X
P676FPP01	12			X
P677FPP01	12			X
P682FPP01	12			X
P684FPP01	12			X
P686FPP01	12			X
P688FPP01	12			X
P692FPP01	12			X
P693FPP01	96		X	
P693FPP02	12			X

13591-S01 – Fiber Optic Patch Panel Schedule

2.010 Tag Number/ Panel ID	2.020 Patch Port Count (Minimum)	2.020 Mounting Type		
		Rack Mount	Wall Mount	Din-Rail Mount
P694FPP01	12			X
P697FPP01	12			X
P699FPP01	12			X
P711FPP02	96		X	
P745FPP01	12			X
P848FPP01	96			X

END OF SCHEDULE

Section 15020

MISCELLANEOUS PIPING AND ACCESSORIES INSTALLATION

PART 1 - GENERAL

1-1. SCOPE. This section covers the installation of piping and accessories as indicated on the Drawings for the following piping sections:

Section Title

Miscellaneous Piping and Accessories

Cast Iron Soil Pipe and Accessories

Copper Tubing and Accessories

Contractor shall furnish all necessary jointing materials, coatings, and accessories that are specified herein.

Pipe supports and anchors shall be furnished by Contractor, and are covered in the Pipe Supports section. Pipe trenching and backfilling are covered in the Trenching and Backfilling section.

1-2. GENERAL.

1-2.01. Coordination. Materials installed under this section shall be installed in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by Engineer.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Items requiring submittals shall include, but not be limited to, the following:

Materials as specified herein.

1-4. QUALITY ASSURANCE.

1-4.01. Welding and Brazing Qualifications. Not Used

1-4.02. Tolerances. These tolerances apply to in-line items and connections for other lines.

The general dimension, such as face-to-face, face or end-to-end, face- or end-to-center, and center-to-center shall be 1/8 inch.

The inclination of flange face from true in any direction shall not exceed 3/64 inch per foot.

Rotation of flange bolt holes shall not exceed 1/16 inch.

1-5. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. Pipe, tubing, and fittings covered herein shall be installed in the services indicated in the various pipe sections.

2-2. MATERIALS.

Threaded Fittings

Anti-Seize Thread Lubricant	Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Never-Seez "Pure Nickel Special", or Permatex "Nickel Anti-Seize".
Teflon Thread Sealer	Paste type; Hercules "Real-tuff", John Crane "JC-30", or Permatex "Thread Sealant with Teflon".
Teflon Thread Tape	Hercules "Tape Dope" or John Crane "Thread-Tape".

Solvent Welded Fittings

Solvent cement for PVC Systems	ASTM D2564.
Solvent cement for CPVC Systems	ASTM F493.
Sodium Hypochlorite, Sodium Hydroxide, and Sodium Bisulfite Service	IPS Corporation "Weld-On 724"
Primer for PVC Systems	ASTM F656.

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Solder or Brazed Fittings

Solder Solid wire, ASTM B32, ANSI/NSF 61 certified, Alloy Grade Sb5, (95-5).

Soldering Flux Paste type, ASTM B813.

Brazing Filler Metal AWS A5.8, BCuP-5; Engelhard "Silvaloy 15", Goldsmith "GB-15", or Handy & Harman "Sil-Fos".

Brazing Flux Paste type, Fed Spec O-F-499, Type B.

Insulating Fittings

Threaded Dielectric steel pipe nipple, ASTM A53, Schedule 40, polypropylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".

Pipe Insulation See Pipe Insulation section 15083.

Watertight/Dusttight Pipe Sleeves O-Z Electrical Manufacturing "Thruwall" and "Floor Seals", or Thunderline "Link-Seals"; with modular rubber sealing elements, nonmetallic pressure plates, and galvanized bolts.

Pipe Sleeve Sealant Polysulfide or urethane, as specified in the Caulking section or as indicated on the Drawings.

PART 3 - EXECUTION

3-1. INSPECTION. All piping components shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and recleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by Owner or his representative before its use.

3-2. PREPARATION.

3-2.01. Field Measurement. Pipe shall be cut to measurements taken at the site, not from the Drawings. All necessary provisions shall be made in laying out piping to allow for expansion and contraction. Piping shall not obstruct openings or passageways. Pipes shall be held free of contact with building construction to avoid transmission of noise resulting from expansion.

3-3. INSTALLATION.

3-3.01. General. All instruments and specialty items shall be installed according to the manufacturer's instructions and with sufficient clearance and access for ease of operation and maintenance.

Flat faced wrenches and vises shall be used for copper tubing systems. Pipe wrenches and vises with toothed jaws will damage copper materials and shall not be used. Bends in soft temper tubing shall be shaped with bending tools.

3-3.02. Pipe Sleeves. Piping passing through concrete or masonry shall be installed through sleeves that have been installed before the concrete is placed or when masonry is laid. Pipe sleeves installed through floors with a special finish, such as ceramic or vinyl composition tile, shall be flush with the finished floor surface and shall be provided with nickel or chromium plated floor plates. Unless otherwise indicated on the Drawings, in all other locations where pipes pass through floors, pipe sleeves shall project not less than 1 inch nor more than 2 inches above the floor surface, with the projections uniform within each area. In the case of insulated pipes, the insulation shall extend through pipe sleeves. Where the Drawings indicate future installation of pipe, sleeves fitted with suitable plastic caps or plugs shall be provided.

Holes drilled with a suitable rotary drill will be considered instead of sleeves for piping which passes through interior walls and through floors with a special finish.

Unless otherwise indicated on the Drawings, all pipes passing through walls or slabs which have one side in contact with earth or exposed to the weather shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies, or with sleeves and modular rubber sealing elements.

3-3.03. Pipe Joints. Pipe joints shall be carefully and neatly made in accordance with the indicated requirements.

3-3.03.01. Threaded. Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be fully and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall

be reamed after threading and before assembly to remove all burrs. Unless otherwise indicated, threaded joints shall be made up with teflon thread tape, thread sealer, or a suitable joint compound.

Threaded joints in plastic piping shall be made up with teflon thread tape applied to all male threads. Threaded joints in stainless steel piping shall be made up with teflon thread sealer and teflon thread tape applied to all male threads. Threaded joints in steel piping for chlorine service shall be made up with teflon thread tape or litharge and glycerine paste applied to all male threads.

3-3.03.02. Compression. Ends of tubing shall be cut square and all burrs shall be removed. The tubing end shall be fully inserted into the compression fitting and the nut shall be tightened not less than 1-1/4 turns and not more than 1-1/2 turns past fingertight, or as recommended by the fitting manufacturer, to produce a leaktight, torque-free connection.

3-3.03.03. Flared. Ends of annealed copper tubing shall be cut square, and all burrs shall be removed prior to flaring. Ends shall be uniformly flared without scratches or grooves. Fittings shall be tightened as needed to produce leaktight connections.

3-3.03.04. Soldered and Brazed. Where solder fittings are specified for lines smaller than 2 inches, joints may be soldered or brazed at the option of Contractor. Brazing alloy shall contain no tin.

Surfaces to be joined shall be thoroughly cleaned with flint paper and coated with a thin film of flux. At each joint, tubing shall enter to the full depth of the fitting socket.

Care shall be taken to avoid overheating the metal or flux. Each joint shall be uniformly heated to the extent that filler metal will melt on contact. While the joint is still hot, surplus filler metal and flux shall be removed with a rag or brush.

3-3.03.05. Solvent Welded. Solvent welded connections shall only be used for PVC or CPVC pipe. All joint preparation, cutting, and jointing procedures shall comply with the pipe manufacturer's recommendations and ASTM D2855. Pipe ends shall be beveled or chamfered to the dimensions recommended by the manufacturer. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the setting time recommended by the manufacturer. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, as set forth in Table X2.1 of ASTM D2855, has elapsed. Solvent welding shall be performed by bonding operators who have met the requirements of ASME B31.3 and A328.

3-3.03.06. Epoxy and Adhesive Bonded. Not Used

3-3.03.07. Heat Fusion Bonded. Not Used

3-3.03.08. Flanged. Not Used

3-3.03.09. Welded. Not Used

3-3.03.10. Grooved Couplings. Grooves for grooved couplings shall be cut with a specially designed grooving tool. Grooves cut in steel pipe shall conform to flexible grooving dimensions, as set forth in AWWA C606, and shall be clean and sharp without burrs or check marks.

3-3.03.11. Push-on. Gasket installation and other jointing procedures shall be in accordance with the recommendations of the manufacturer. Each spigot end shall be suitably beveled to facilitate assembly. All joint surfaces shall be lubricated with a heavy vegetable soap solution immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean.

3-3.03.12. Rubber-Gasketed. Rubber-gasketed joints for hub and spigot type cast iron soil pipe shall have plain spigot ends, without beads. Cut ends of all pipe shall be cut square, beveled, and all burrs shall be removed. Spigot ends shall be coated with a lubricant recommended by the gasket manufacturer and fully seated in the gasket. Clamps for hubless cast iron soil pipe shall be installed in accordance with the manufacturer's recommendations.

3-3.03.13. Other Pipe Joints. Not Used

3-3.04. Pipe. Pipe shall be installed as specified, as indicated on the Drawings, or, in the absence of detail piping arrangement, in a manner acceptable to Engineer.

Piping shall be installed without springing or forcing the pipe in a manner which would induce stresses in the pipe, valves, or connecting equipment.

Piping shall be supported in conformance with the Pipe Supports section.

Piping shall be connected to equipment by flanges or unions as specified in the various piping sections. Piping connecting to equipment shall be supported by a pipe support and not by the equipment.

Water, gas, and air supply piping shall be provided with a shutoff valve and union at each fixture or unit of equipment, whether or not indicated on the Drawings, to permit isolation and disconnection of each item without disturbing the remainder of the system. Air supply piping shall be provided with sectionalizing valves and valved air inlet connections as needed for isolation of portions of the system for

periodic testing. Gas supply lines to buildings shall be provided with a shutoff valve and union located above grade immediately outside the building. A capped drip leg shall be provided at the bottom of the vertical riser of gas supply piping adjacent to gas-fired appliances.

A union shall be provided within 2 feet of each threaded-end valve unless there are other connections which will permit easy removal of the valve. Unions shall also be provided in piping adjacent to devices or equipment which may require removal in the future and where required by the Drawings or the Specifications.

Water supply piping within structures shall be arranged, and facilities provided, for complete drainage. All piping serving metering equipment shall be uniformly graded so that air traps are eliminated and complete venting is provided.

In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.

Branch connections in horizontal runs of steam, air, and gas piping shall be made from the top of the pipe.

Drains required for operation are shown on the Drawings. However, vents at all high points and drains at all low points in the piping that are required for complete draining for pressure test may not be shown on these Drawings. Contractor shall add such items as found to be necessary during detail piping design and/or piping installation.

3-3.05. Reducers. Eccentric reducers shall be installed flat on the bottom for steam, condensate return and digester gas services.

3-3.06. Valves. Isolation valves provided with equipment and instruments shall be located in a manner which will allow ease of access and removal of the items to be isolated. Prior to soldering or brazing valves, teflon and elastomer seats and seals shall be removed to prevent damage.

3-4. PIPING ASSEMBLY.

3-4.01. General. Contractor shall only use labor that has been qualified by training and experience to capably perform the specified activities required to accomplish the work in a satisfactory manner

Any deviations from the Specifications or piping locations shown on the Drawings require prior review and approval by Engineer.

3-4.02. Buttwelded Piping. Not Used

3-5. PROTECTIVE COATING. Not Used

3-6. PRESSURE AND LEAKAGE TESTING. All specified tests shall be made by and at the expense of Contractor in the presence, and to the satisfaction of Engineer. Each piping system shall be tested for at least 1 hour with no loss of pressure. The Contractor shall coordinate this section with the Pipeline Pressure and Leakage Testing section. Piping shall be tested at the indicated pressures:

<u>Service</u>	<u>Test Pressure</u>	<u>Test Medium</u>
Water supply	1-1/2 times working pressure but not less than 120 psi	Water
Other piping	1-1/2 times working pressure but not less than 50 psi	Suitable fluid or gas; for distilled water piping, distilled water or filtered oil-free compressed air may be used

Compressed air or pressurized gas shall not be used for testing plastic piping unless specifically recommended by the pipe manufacturer.

Leakage may be determined by loss-of-pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to Engineer. All fixtures, devices, or accessories which are to be connected to the lines and which would be damaged if subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped as needed during the testing.

Unless otherwise required by the applicable codes, drainage and venting systems shall be water tested. For water testing, the drainage and venting system shall be filled with water to the level of the highest vent stack. Openings shall be plugged as necessary for either type of test. To be considered free of leaks, the system shall hold the water for 30 minutes without any drop in the water level or air pressure.

All necessary testing equipment and materials, including tools, appliances and devices, shall be furnished and all tests shall be made by and at the expense of

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Contractor. Contractor shall give Engineer 5 working days advanced notice of scheduled testing.

All joints in piping shall be tight and free of leaks. All joints which are found to leak, by observation or during any specified test, shall be repaired, and the tests repeated.

3-7. CLEANING. The interior of all pipe, valves, and fittings shall be smooth, clean, and free of blisters, loose mill scale, sand, dirt, and other foreign matter when installed. Before being placed in service, the interior of all lines shall be thoroughly cleaned, to the satisfaction of Engineer.

3-8. ACCEPTANCE. Owner reserves the right to have any section of the piping system which he suspects may be faulty cut out of the system by Contractor for inspection and testing. Should the joint prove to be sound, Owner will reimburse Contractor on a time-and-material basis as specified in the Contract. Should the joint prove to be faulty, the destructive test will continue joint by joint in all directions until sound joints are found. Costs for replacement of faulty work and/or materials shall be the responsibility of Contractor.

End of Section

Section 15050

BASIC MECHANICAL BUILDING SYSTEMS MATERIALS AND METHODS

PART 1 - GENERAL

1-1. SCOPE. This section covers general mechanical building system requirements as referenced from other sections for the plumbing and heating, ventilating, and air conditioning systems. Protective coatings for ductwork and equipment without special coatings shall be as specified in the Protective Coatings and Architectural Painting sections.

Mechanical identification

Special coatings

1-2. GENERAL. Materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the manufacturer unless exceptions are noted by the Engineer.

1-2.01. Coordination. Where two or more units of the same class of materials are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

1-2.02. General Equipment Stipulations. The General Equipment Stipulations shall apply to all materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-2.03. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable local codes and ordinances, laws, and regulations which pertain to such work. In case of a conflict between these specifications and any state law or local ordinance, the latter shall govern.

1-2.04. Metal Thickness. Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete information, detailed specifications, and data covering materials, parts, devices, and accessories forming a part of the

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materials furnished, shall be submitted in accordance with the Submittals Procedures section.

1-4. QUALITY ASSURANCE.

1-4.01. Welding Qualifications. All welding procedures and welding operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of AWS Standard Qualification Procedures. All procedure and operator qualifications shall be in written form and subject to Engineer's review. Accurate records of operator and procedure qualifications shall be maintained by Contractor and made available to Engineer upon request.

1-4.02. Manufacturer's Experience. Unless the equipment manufacturer is specifically named in this section, the manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. All equipment shall be designed and selected to meet the specified conditions. Where equipment is provided with special coatings, unit capacities shall be corrected to account for any efficiency losses from the selected special coating.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS.

2-2.01. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract Drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Engineer.

2-2.02. Elevation. Equipment shall be designed to operate at the elevation indicated in the Meteorological and Seismic Design Criteria section. All equipment furnished for sites above 2000 feet above sea level shall be properly derated to operate and meet the specified capacities at the site conditions.

2-2.03. Equipment Efficiencies. Unless otherwise indicated in the respective equipment paragraph, the equipment efficiency shall be in accordance with the requirements of ASHRAE Energy Standard 90.1.

2-2.04. Drive Units. Drive units shall be designed for 24 hour continuous service.

2-2.04.01. V-Belt Drives. Each V-belt drive shall include a sliding base or other suitable belt tension adjustment. V-belt drives shall have a service factor of at

least 1.5 at maximum speed based on the nameplate horsepower [kW] of the drive motor unless otherwise indicated in the specific equipment paragraph. Multiple belts shall be provided in matched sets and shall be oil resistant, non-static type. External belts and drive assemblies shall be protected by a belt safety guard constructed in accordance with OSHA requirements. The guard shall be provided with a tachometer opening.

Unless otherwise indicated in the specific equipment paragraph, equipment with smaller than 10 horsepower [7.5 kW] motors shall have adjustable pitch sheaves and equipment with 10 horsepower [7.5 kW] and larger motors shall have fixed sheaves. Adjustable sheaves shall be selected so that the fan speed at the specified conditions is selected at the mid-position of the sheave range. Fixed sheaves shall be replaced as necessary with sheaves of the proper size during the air system balancing to provide the required speed for the specified airflow.

2-2.04.02. Electric Motors. Motor horsepower scheduled on the Drawings are minimum motor horsepower. Larger motors shall be provided if required to meet the specified capacities for the equipment furnished. Motors furnished with equipment shall meet the following requirements.

- a. Premium efficient motors with a minimum efficiency of at least that specified in the Common Motor Requirements for Process Equipment section shall be provided where available as a standard option. All other motors shall meet the minimum efficiency standards required by the 2007 Energy Independence and Security Act.
- b. Designed and applied in accordance with NEMA, ANSI, IEEE, AFBMA, and NEC for the duty service imposed by the driven equipment, such as frequent starting, intermittent overload, high inertia, mounting configuration, or service environment.
- c. Rated for continuous duty at 40°C ambient.
- d. Motors used in applications which exceed the usual service conditions as defined by NEMA, such as higher than 40°C ambient, altitude exceeding 3,300 feet, explosive or corrosive environments, departure from rated voltage and frequency, poor ventilation, frequent starting, or adjustable frequency drive applications, shall be properly selected with respect to their service conditions and shall not exceed specified temperature rise limits in accordance with ANSI/NEMA MG 1 for insulation class, service factor, and motor enclosure type.
- e. To ensure long life, motors shall have nameplate horsepower [kW] equal or greater than the maximum load imposed by the driven equipment and shall carry a service factor rating as follows:

<u>Motor Size</u>	<u>Enclosure</u>	<u>Service Factor</u>
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Fractional hp [kW]	Open	1.15
	Other Than Open	1.0
Integral hp [kW]	Open	1.15
	Other Than Open	1.0

Motors used with adjustable frequency drives shall have a 1.15 service factor on sine wave power and a 1.0 service factor on drive power.

- f. Designed for full voltage starting.
- g. Designed to operate from an electrical system that may have a maximum of 5 percent voltage distortion according to IEEE 519.
- h. Totally enclosed motors shall have a continuous moisture drain that also excludes insects.
- i. Bearings shall be either oil or grease lubricated.
- j. Motor nameplates shall indicate as a minimum the manufacturer name and model number, motor horsepower, voltage, phase, frequency, speed, full load current, locked rotor current, frame size, service factor, power factor, and efficiency.
- k. Dripproof motors, or totally enclosed motors at Contractor's option, shall be furnished on equipment in indoor, above-grade, clean, and dry locations.
- l. Totally enclosed motors shall be furnished on:
 - (1) Outdoor equipment.
 - (2) Equipment for installation below grade.
 - (3) Equipment operating in chemical feed and chemical handling locations.
 - (4) Equipment operating in wet or dust-laden locations.
- m. Explosionproof motors shall be furnished as specified by applicable codes or as specified in other sections.
- n. A manufacturer's standard motor may be supplied on packaged equipment and fans in which case a redesign of the unit would be required to furnish motors of other than the manufacturer's standard design. However, in all cases, the motor types indicated are preferred and shall be furnished if offered by the manufacturer as a standard option.
- o. Motors used with adjustable frequency drives shall have insulation system meeting the requirements of NEMA MG 1, Part 31.

2-3. MANUFACTURE AND FABRICATION.

2-3.01. Welding. All welds shall be continuous (seal type) on submerged or partially submerged components.

2-3.02. Anchor Bolts and Expansion Anchors. Anchor bolts, expansion anchors, nuts, and washers shall be as indicated in the Anchorage in Concrete and Masonry section unless otherwise indicated on the Drawings.

2-3.03. Edge Grinding. Sharp corners of cut or sheared edges which will be submerged in operation shall be dulled by at least one pass of a power grinder to improve paint adherence.

2-3.04. Surface Preparation. All iron and steel surfaces, except motors, shall be shop cleaned by sandblasting or equivalent, in strict conformance with the paint manufacturer's recommendations. All mill scale, rust, and contaminants shall be removed before shop primer is applied.

2-4. MATERIALS.

2-4.01. Mechanical Identification. Mechanical identification consisting of equipment number plates, equipment information plates, valve tags, and ductwork identification shall conform to the requirements of the Equipment and Valve Identification section and as indicated herein.

2-4.01.01. Number Plates. Hand-lettered or tape labels will not be acceptable.

Number plates for control equipment such as but not limited to thermostats, control stations, and emergency ventilation shutoff switches shall in addition to the specific device identification list the controlled equipment in parenthesis below the device number.

2-4.01.02. Piping. Piping identification shall be as specified in the Protective Coatings section. The lettering size, length of color field, colors, and viewing angles of identification devices shall be in accordance with ASME A13.1.

2-4.01.03. Valves. Not used.

2-4.01.04. Ductwork. Ductwork shall be identified with nameplates as specified herein, or stenciled painting. Ductwork shall be identified with the equipment number and area served, direction of airflow, and service (supply, return, mixed, exhaust, and outside air). The identification shall be located at equipment, at each side of structure or enclosure penetrations, and at each obstruction.

2-4.02. Seismic Design. Not used.

PART 3 - EXECUTION

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3-1. INSTALLATION. Materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by the Engineer.

The installation of identifying devices shall be coordinated with the application of covering materials and painting where devices are applied to surfaces. All surfaces to receive adhesive number plates shall be cleaned before installation of the identification device.

End of Section

Section 15065

MISCELLANEOUS STEEL PIPE, TUBING, AND ACCESSORIES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of miscellaneous steel pipe, tubing and accessories that for pipe diameters 24 inches and smaller. Pipe and tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

Steel pipe for potable and non-potable water conveyance are covered in the Steel Pipe section.

1-2. GENERAL.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

- Name of Manufacturer
- Type and model
- Construction materials, thickness, and finishes
- Pressure and temperature ratings

Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1-4. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

1-4.01. Coated Pipe. Handling methods and equipment used shall prevent damage to the protective coating and shall include the use of end hooks, padded calipers, and nylon or similar fabric slings with spreader bars. Bare cables, chains, or metal bars shall not be used. Coated pipe shall be stored off the ground on wide, padded skids. Plastic coated pipe shall be covered or otherwise protected from exposure to sunlight.

PART 2 - PRODUCTS

2-1. GALVANIZED STEEL PIPE. Not used.

2-2. STEEL PIPE. Steel pipe materials and service shall be as specified herein.

2-2.03. Material Classification CS-3.

CS-3 – Standard Weight Steel with Buttwelded Fittings. Steam and condensate piping. Heating water system piping. Chilled water system piping. 2-1/2 inch 63 mm and larger.	<table border="0"> <tr> <td>Pipe</td> <td>ASTM A53/A106, Type S, standard weight Grade B; Bevel ends.</td> </tr> <tr> <td>Fittings</td> <td>Buttwelded. Fitting shall conform to ANSI/ASME B16.9, standard weight.</td> </tr> </table>	Pipe	ASTM A53/A106, Type S, standard weight Grade B; Bevel ends.	Fittings	Buttwelded. Fitting shall conform to ANSI/ASME B16.9, standard weight.
Pipe	ASTM A53/A106, Type S, standard weight Grade B; Bevel ends.				
Fittings	Buttwelded. Fitting shall conform to ANSI/ASME B16.9, standard weight.				

2-2.04. Material Classification CS-4.

CS-4 – Extra Strong Steel with Threaded Fittings. Heating water system piping. Chilled water system piping. 2 inch 50 mm and smaller.	<table border="0"> <tr> <td>Pipe</td> <td>ASTM A53/A106, Type S, extra strong, Grade B; Threaded ends.</td> </tr> <tr> <td>Fittings</td> <td>Forged steel, threaded. Fittings shall conform to ANSI B16.11, Class 2000 or 3000; Bonney, Crane, Ladish, or Vogt.</td> </tr> </table>	Pipe	ASTM A53/A106, Type S, extra strong, Grade B; Threaded ends.	Fittings	Forged steel, threaded. Fittings shall conform to ANSI B16.11, Class 2000 or 3000; Bonney, Crane, Ladish, or Vogt.
Pipe	ASTM A53/A106, Type S, extra strong, Grade B; Threaded ends.				
Fittings	Forged steel, threaded. Fittings shall conform to ANSI B16.11, Class 2000 or 3000; Bonney, Crane, Ladish, or Vogt.				

2-2.15. Accessory Materials. Accessory materials for the miscellaneous steel pipe and tubing systems shall be as indicated.

Nipples

ASTM A733, seamless, extra strong (Schedule 80); "close" nipples will be

	permitted only by special authorization in each case.
Unions (Malleable Iron)	Fed Spec WW-U-53I, Class 2; Type B (galvanized) for galvanized pipe or Type A (black) for ungalvanized pipe.
Flanges	
Standard Weight Pipe	ANSI/ASME B16.5, Class 150, flat faced when connected to flat faced flanges; otherwise, raised face.
Extra Strong Pipe	
Other services	ANSI/ASME B16.5, Class 300, raised face.
Flange Bolts and Nuts	ASTM A193, Grade B7 with ASTM A194 Grade 2H nuts. Length such that, after installation, the bolts will project 1/8 to 3/8 inch [3 to 10 mm] beyond outer face of the nut.
Flange Gaskets	
For Heating Water Service	Non-asbestos inorganic fiber with nitrile binder; dimensions to suit flange contact face, 1/16 inch [1.5 mm] minimum thickness for plain finished surfaces, 3/32 inch [2 mm] minimum thickness for serrated surfaces; Garlock "IFG 5500".
For Water Service	ASTM D1330, Grade I, red rubber, ring type, 1/8 inch [3 mm] thick.
Grooved Couplings	
Rigid	AWWA C606; Gustin-Bacon "No. 120 Rigid" or Victaulic "07 Zero-Flex".
Standard	AWWA C606; Gustin-Bacon "No. 100 Standard" or Victaulic "Style 77".
Mechanical Couplings	Dresser "Style 38" or Smith-Blair "Type 411 Flexible Coupling"; without pipe stop.
Expansion Joints	
Heating water, chilled water, and other services not specified.	Flexonics "Model H Expansion Compensators" for 3 inch [75 mm] or smaller; Flexonics "Mid-Corr, Series MCB" with flanged ends and stainless steel bellows for 4 inch [100 mm] or larger. Expansion

15065 - Miscellaneous Steel Pipe, Tubing, and Accessories

joints shall be suitable for working pressures up to 150 psig [1035 kPa].

2-3. COATINGS. Standard weight steel pipe in buried locations, except hot piping such as aeration air piping, shall have exterior surfaces protected with a shop applied plastic coating. Coatings for hot piping shall be as specified.

Shop applied coatings shall be as follows:

External Coatings

Plastic

Liberty Coating Company "Pritec" or Bredero-Shaw "Entec". The products of other manufacturers will not be acceptable.

PART 3 - EXECUTION

3-1. INSTALLATION. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

Section 15069

CAST IRON SOIL PIPE AND ACCESSORIES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of cast iron soil pipe and accessories for the service conditions as specified herein. Cast iron soil pipe shall be furnished complete with all fittings and other accessories.

1-2. SUBMITTALS.

1-2.01. Drawings and Data. Complete specifications, data and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Items requiring submittals shall include, but shall not be limited to, the following:

Pipe, Gaskets, and Couplings.

Name of Manufacturer.

Type and Model.

Construction materials, thickness, and finishes.

Coating product data sheets.

Certification by manufacturer that the pipe and fittings furnished are in accordance with referenced standards. Certification shall include legal name and address of the manufacturer.

1-3. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and Storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

2-1. MATERIALS.

2-1.01. Product Marking. Pipe and fittings shall bear manufacturer's product marking as required by the referenced standards. Markings shall be plainly marked including but not limited to country of origin, manufacturer's name, and date of manufacturer.

2-1.02. Material Classification CI-1.

CI-1 – Bell and Spigot	Pipe and Fittings	ASTM A74
Building sanitary drain, waste, and vent piping, all locations. Building storm drain piping, all locations. Clear water waste piping, all locations	Jointing Material	Rubber gaskets, ASTM C564.

2-1.03. Material Classification CI-2.

CI-2 – Hubless	Pipe and Fittings	CISPI 301.
Building sanitary drain, waste, and vent piping, all locations except where buried. Building storm drain piping, all locations except where buried. Clear water waste piping, all locations except where buried.	Jointing Material	Heavy duty coupling, with neoprene rubber sleeve, 304 stainless steel shield, and stainless steel clamping bands, or bolted cast iron coupling with stainless steel bolts and neoprene gasket. Couplings shall be Clamp-All Products “HI-TORQ 125”, Husky “SD 4000”, Mission Rubber Company LLC “HeavyWeight Coupling”, or MG Piping Products “MG Coupling”, without exception.

PART 3 - EXECUTION

3-1. **INSTALLATION**. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

Section 15070

COPPER TUBING AND ACCESSORIES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of copper tubing and accessories. Copper tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

1-2. SUBMITTALS.

1-2.01. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

- Name of Manufacturer
- Type and model
- Construction materials, thickness, and finishes
- Pressure and temperature ratings

Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1-3. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

2-1. MATERIALS. Copper tubing materials and service shall be as specified herein.

2-1.01. Material Classification CU-1. Not used.

2-1.02. Material Classification CU-2. Not used.

2-1.03. Material Classification CU-3.

CU-3 – Water Tubing with Solder and Brazed Joints Potable and non-potable water supply, 3 inch and smaller. Hot water supply.	Tubing	Hard drawn copper tubing, ASTM B88, Type L.
	Fittings	Solder joint (smaller than 2 inch except compressed air piping), Brazed joint (2 inch and larger for piping other than compressed air and all sizes for compressed air piping), material to match tubing. Fittings shall conform to ANSI B16.18, or ANSI/ASME B16.22.
	Flanges	Where required for connection to equipment, valves, and accessories, ANSI B16.24, class 150, cast bronze, brazed joint.

2-1.04. Material Classification CU-4. Not used.

2-1.05. Material Classification CU-5. Not used.

2-1.06. Material Classification CU-6. Not used.

2-1.07. Material Classification CU-7.

CU-7 – ARC Tubing with Brazed Fittings Refrigerant piping.	Tubing	Hard drawn ACR copper tubing, ASTM B280. Dimensions shall be in accordance with ASTM B280.
	Fittings	Brazed.

2-1.08. Material Classification CU-8. Not used.

2-1.09. Accessory Materials. Accessory materials for the copper tubing systems shall be as indicated.

Flange Bolts and Nuts

ASTM A307, Grade B, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.

Flange Gaskets	ASTM D1330, Grade I, red rubber, ring type, 1/8 inch thick.
Expansion Joints	Tempflex "Model HB Expansion Compensators" with copper tube ends.
Insulating Fittings	
Threaded	Dielectric steel pipe nipple, ASTM A53, Schedule 40, poly-propylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".
Flanged	EpcO "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

PART 3 - EXECUTION

3-1. INSTALLATION. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

Section 15400

PLUMBING

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of materials, appliances, fixtures, equipment, and appurtenances associated with the plumbing systems as specified herein and as indicated on the Drawings. Additional requirements for plumbing systems shall be as indicated in the schedules on the Drawings. Suitable connections shall be provided for each fixture, piece of equipment, and appurtenance.

Pipe materials, valves, thermal insulation, and pipe supports which are not an integral part of the fixture or piece of equipment and are not specified herein are covered in other sections.

1-2. GENERAL. Materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the manufacturer unless exceptions are noted by Engineer.

1-2.01. Coordination. Contractor shall verify that each component of the plumbing system is compatible with all other parts of the system; that all piping and appurtenances are appropriate; and that all devices necessary for a properly functioning system have been provided.

Where two or more units of the same class of equipment are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

1-2.02. General Equipment Stipulations. Not used

1-2.03. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.04. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable

1-5. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

1-6. EXTRA MATERIALS. Extra materials shall be furnished for each type and size of plumbing fixture or equipment as required, in the quantities indicated below.

<u>Part</u>	<u>Number Required</u>
Faucet washer cartridge and O-ring kits	1 per 5 fixtures

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. All plumbing fixtures and equipment shall be designed and selected to meet the specified conditions.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS. All fixtures and equipment shall be designed to meet the performance and design conditions specified herein and indicated on the Drawings.

2-2.01. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values. Contractor shall review the contract Drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Engineer.

2-3. ACCEPTABLE MANUFACTURERS. Acceptable manufacturers shall be as listed in the respective product description paragraphs.

2-4. MANUFACTURE AND FABRICATION.

2-4.01. Anchor Bolts and Expansion Anchors. Anchor bolts, expansion anchors, nuts, and washers shall be as indicated in the Anchorage In Concrete and Masonry section unless otherwise indicated on the Drawings.

2-4.02. Surface Preparation. All iron and steel surfaces, except motors and speed reducers, shall be shop cleaned by sandblasting or equivalent, in strict conformance with the paint manufacturer's recommendations. All mill scale, rust, and contaminants shall be removed before shop primer is applied.

2-4.03. Shop Painting. All steel and iron surfaces shall be protected by suitable coatings applied in the shop. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, speed reducers, starters, and other

self-contained or enclosed components shall be shop primed or finished with an oil-resistant enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer.

Surface finish damaged during installation shall be repaired to the satisfaction of Engineer. Field painting shall conform to the requirements of the Protective Coatings section.

2-4.04. Equipment Bases. Not used

2-4.05. Special Tools and Accessories. Not used

2-4.06. Piping Systems. Unless otherwise specified herein, piping system materials shall be as specified in other sections.

2-4.07. Valves. Unless otherwise specified herein, valves indicated to be a part of the plumbing systems shall be as specified in other sections.

2-5. WATER SUPPLY PIPING ACCESSORIES.

2-6. DRAINAGE AND VENT PIPING ACCESSORIES.

2-6.01. Cleanouts. Cleanouts shall be provided where indicated on the Drawings and required by the referenced codes, and shall be of the required type.

Floor cleanouts shall consist of a two piece body, a threaded plug, an adjustable head, and a cover. Cleanouts installed in floors that include a waterproofing membrane shall be provided with a flashing flange and membrane clamp. Cleanouts installed in partition walls shall be provided with an access cover and frame with a securing screw installed over the cleanout plug. Wall cleanout covers shall be stainless steel. Cleanouts installed in exposed piping shall consist of a ferrule or threaded adapter and a cast brass or bronze plug installed in a T-pattern, 90 degree drainage fitting.

Cast iron cleanouts shall be manufactured by Smith, Josam, or Wade. Polypropylene cleanouts shall be manufactured by Orion, Enfield, or Zurn. PVC cleanouts shall be manufactured by Sioux Chief, Plastic Oddities, or Zurn.]

2-6.02. Bell-Up Drains. Not used.

2-6.03. Funnel Receptors. Not used

2-6.04. Floor Drains. Not used

2-6.05. Roof Drains and Overflow Roof Drains. Not used

2-6.06. Downspout Nozzles. Not used.

2-6.07. Modular Trench Drain System. Not used

2-6.08. Floor Sinks. Not used

2-6.09. Backwater Valves. Not used.

2-6.10. Vent Flashings. Plumbing vent flashings shall be furnished and installed as indicated on the Drawings.

2-7. PLUMBING FIXTURES AND ACCESSORIES.

2-7.01. Janitors Sinks. Janitors sink types, dimensions, manufacturers, and models shall be as indicated on the Drawings.

Mop sinks shall be floor mounted and constructed of pearl gray terrazzo. Mop sinks shall be provided with an integral 20 gage [0.91 mm] thick stainless steel threshold cap, a 6 inch [150 mm] drop at threshold, and a shoulder at least 1-1/4 inches [32 mm] wide. A 3 inch [75 mm] cast brass drain and stainless steel strainer, and where indicated, a 20 gage [0.91 mm] thick stainless steel splash panel shall be provided for each sink. Mop sinks shall be manufactured by Stern-Williams, Fiat, or Florestone Products Company, Inc.

2-7.01.01. Faucets. Sink faucets shall be rough plated brass, with lever handles, a threaded spout, a vacuum breaker, a wall brace, and a pail hook. The distance from the wall to the center of the spout outlet shall measure approximately 7-1/2 inches. Sink faucets shall be as manufactured by American Standard, Kohler, or Eljer.

2-7.01.02. Drain Assembly. Mop sinks shall be provided with a 3 inch cast brass drain and a stainless steel strainer. Service sinks shall be provided with a 3 inch [75 mm] cast iron P-type trap standard, with a stainless steel strainer, a cleanout plug, and a threaded outlet.

2-8. PLUMBING EQUIPMENT. Not used.

2-9. COLOR. Not used.

2-10. ELECTRICAL. Not used.

PART 3 - EXECUTION

3-1. INSPECTION. Equipment installed in existing facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

3-2. PREPARATION.

3-2.01. Surface Preparation. All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit mud, oil, grease, rust, loose mill scale, or other objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner which will prevent dust or other contaminants from getting on freshly painted surfaces. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted surfaces shall be dulled if necessary for proper adhesion of top coats.

3-3. INSTALLATION. Materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

Unless otherwise indicated, sleeves shall be provided for all pipe penetrations through concrete and masonry walls. Sleeves and sealing requirements shall be as indicated in the Miscellaneous Piping and Accessories Installation section and as indicated on the Drawings.

Not all required reducing fittings and unions are indicated. Additional fittings and unions shall be provided as needed to connect all equipment and appurtenances.

Insulating fittings shall be provided to prevent the contact of dissimilar metals in piping systems.

When located indoors, fuel gas pressure regulator vents and fuel train vent valves shall be piped to the exterior of the building in accordance with the applicable codes and standards.

Piping shall not be routed over or in front of electrical switchboards or panels unless acceptable to Engineer.

3-3.01. Water Supply Piping and Accessories. Water hammer arresters shall be provided in the hot and cold water supply piping at all quick closing valves, at solenoid valves, and at plumbing fixtures. When not indicated on the Drawings, arresters shall be located and sized by Contractor in accordance with PDI Standard No. WH201. Contractor shall submit arrester location and sizing plans to Engineer for approval prior to installation. Where possible, water hammer arresters shall be installed in an accessible location.

Water supply piping to hose faucets and hose valves shall be secured with a pipe support within 6 inches of the fixture.

3-3.02. Drainage and Vent Piping and Accessories. Unless otherwise indicated or required by code, horizontal sanitary drainage piping 3 inches in diameter or smaller shall be installed at a uniform slope of 1/4 inch per foot [2 percent]; horizontal sanitary drainage piping larger than 3 inches in diameter shall be installed at a uniform slope of 1/8 inch per foot ; horizontal storm drainage piping shall be installed at a uniform slope of 1/8 inch per foot.

Drainage fittings shall be installed to convey flow in the piping in the intended direction. To the extent possible, changes in direction shall be made by sweep type fittings. Quarter-bends and sanitary tee fittings shall not be installed for vertical to horizontal or horizontal to horizontal changes of direction.

Plumbing vents through roofs shall be located at least 12 inches from a parapet or from the intersection of a cant with the roof deck, and shall be installed with watertight flashings. Plumbing vents shall be located no closer to operable windows or air intakes than is allowed by the applicable code.

Vents connecting to horizontal sanitary piping shall connect above the centerline of the piping and shall rise at an angle of not less than 45 degrees from the horizontal to a point at least 6 inches above the flood level rim of the fixture served before offsetting horizontally.

Cleanouts on drainage piping inside structures shall be located where indicated on the Drawings. Additional cleanouts shall be provided where required by the applicable code or authority having jurisdiction. Cleanouts located in drainage risers shall be located 12 inches above the finished floor.

Unless otherwise indicated or required by the applicable code, cleanout size shall equal the line size for 4 inch and smaller drainage piping, and 4 inches in diameter for drains larger than 4 inch. Proper clearance shall be provided for access to cleanouts. Floor cleanouts shall be installed flush with the finished floor.

3-3.03. Plumbing Fixtures and Accessories. Plumbing fixtures shall be set level and plumb, and shall be securely attached to the floor or wall. Unless otherwise

indicated on the Drawings, each fixture shall be mounted at the height recommended by the manufacturer. Where required to be in compliance with ADA, fixtures shall be mounted at the heights established by the Federal Government.

Fixtures shall be sealed to the floor or wall with a sealant as specified in the Joint Sealants section. The color of sealant shall match the color of the fixture.

Fixture traps shall be easily removable for servicing and cleaning. Escutcheons shall be placed at all locations where fixture supply or drain piping penetrates walls, floors, or ceilings.

Water piping at stop valves, shower heads, and flush valves shall be rigidly secured to blocking. Drop-ear elbows shall be used whenever possible. All water supply piping shall be cleaned and flushed before the plumbing fixtures are installed.

3-4. FIELD QUALITY CONTROL.

3-4.01. Installation Check.

The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the Contract Price.

3-4.02. Startup and Testing. Field performance tests shall be conducted to demonstrate that each system is functioning as specified and to the satisfaction of Engineer.

If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable.

3-5. ADJUSTING. All devices shall be adjusted for proper flow and quiet operation. Faucet and supply assemblies shall be adjusted or repaired to eliminate leaks. All drains shall be checked for proper operation.

3-6. PROTECTION. Plumbing fixtures, equipment and appurtenances shall be protected from damage immediately after installation. Plumbing fixtures shall not be used during the construction.

3-7. CLEANING. After completion of testing and immediately before the final inspection, plumbing fixtures, equipment, piping, and appurtenances shall be thoroughly cleaned. Cleaning materials and methods shall be as recommended by the manufacturer.

Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired at no additional cost to Owner.

3-8. DISINFECTION. Not used

3-9. OPERATOR INSTRUCTION AND TRAINING. Not used

End of Section

Section 15500

HEATING, VENTILATING, AND AIR CONDITIONING

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of heating, ventilating, and air conditioning (HVAC) equipment, devices, and appurtenances associated with the HVAC systems.

Piping, pipe supports, valves, and accessories which are not an integral part of the equipment or are not specified herein are covered in other sections.

1-2. GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

1-2.01. Coordination. Contractor shall verify that each component of the system is compatible with all other parts of the system; that all piping, ductwork, materials, fans, and motor sizes are appropriate; and that all devices necessary for a properly functioning system have been provided. Where two or more units of the same class of equipment are needed, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

1-2.02. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-2.03. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.04. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall comply with UL safety requirements.

1-2.05. Power Supply. Power supply to equipment with motors shall be as indicated in schedules on the Drawings. Power supply for controls shall be 120 volts, 60 Hz, single phase unless otherwise required for a properly operating system.

1-2.06. Metal Thickness. Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

1-2.07. Mechanical Identification. Mechanical identification shall conform to the requirements of the Basic Mechanical Building Systems Materials and Methods section.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete assembly and installation drawings, and wiring and schematic diagrams, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Submittals Procedures section. Device tag numbers indicated on the Drawings shall be referenced on the wiring and schematic diagrams where applicable. The data and specifications for each unit shall include, but shall not be limited to, the following:

Furnaces

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

Capacities.

Filter velocities.

Overall dimensions and required clearances.

Net weight and load distribution.

Performance tables with the specified operating point clearly identified for each unit, type, and model, with capacity in cubic feet per minute [m³/s], speed or rpm, brake horsepower, and static pressure listed.

Multiline wiring diagrams clearly indicating factory installed and field installed wiring with all terminals identified.

Electrical requirements including voltage, number of phases, and amperage.

Where specified, information on equipment manufacturers' representatives.

Fans

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

Overall dimensions and required clearances.

Net weight and load distribution.

Performance curves with the specified operating point clearly identified for each unit, type, and model, with capacity in cubic feet per minute [m³/s] as the abscissa and brake horsepower, static pressure, and efficiency as the ordinate. The fan curves shall include a family of curves for at least 3 different rotative speeds on a single chart.

Certified AMCA standard test code sound power output data for the fan outlet and casing when operating at the specified volume flow rate.

Sound data shall list dB re 10⁻¹² watts in each octave band, with midrange frequencies starting at 63 Hz and ending at 8,000 Hz.

Where specified, information on equipment manufacturers' representatives.

Sheet Metal Ductwork

Sheet metal duct fabrication drawings indicating dimensions of individual shop and field fabricated sections, top and/or bottom duct elevations, joint locations, and dimensions of duct from walls or column rows.

Pressure and seal classifications.

Reinforcement types and spacing.

Joint and seam types.

Hanger and support types, spacing, and attachment methods.

Access panel and door construction, sizes, and locations.

Duct sealant, adhesive, gasket, and tape information.

Ductwork materials and thicknesses.

Product data demonstrating compliance with ASHRAE 62.1

Seismic Design Requirements

Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-3.02. Operation and Maintenance Data and Manuals. Adequate operation and maintenance information shall be supplied as required in the Submittals Procedures section. Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

In addition to the requirements of the Submittals Procedures section, the operation and maintenance manuals shall include a listing of all filter locations, types, sizes, and quantities associated with each piece of equipment.

1-4. QUALITY ASSURANCE. Quality assurance shall comply with the requirements of the Basic Mechanical Building Systems Materials and Methods section.

1-5. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and Storage shall be in accordance with the Product Storage and Handling Requirements section.

1-6. EXTRA MATERIALS. Extra materials shall be furnished for the equipment as specified in the individual equipment paragraphs.

Extra materials shall be packaged in accordance with the Product Delivery Requirements section, with labels indicating the contents of each package. Each label shall indicate manufacturer's name, equipment name, equipment designation, part nomenclature, part number, address of nearest distributor, and current list price. Extra materials shall be delivered to Owner as directed.

Extra materials subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping.

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. All equipment shall be designed and selected to meet the specified conditions.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS. Equipment and coil capacities shall be as indicated on the schedules. Where equipment is provided with special coatings, unit capacities shall be corrected to account for any efficiency losses from the selected special coating.

Each fan's operating selection point on the fan curves shall be selected to the right of the peak pressure/efficiency point and below the lowest point along the fan curve to the left of the peak pressure/efficiency point.

2-2.01. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract Drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Engineer. At least 3 feet of clear access space shall be provided on all sides of the unit unless otherwise indicated.

2-2.02. Elevation. Equipment shall be designed to operate at the elevation indicated in the Meteorological and Seismic Design Criteria section. All equipment furnished for sites above 2000 feet above sea level shall be properly derated to operate and meet the specified capacities at the site conditions.

2-3. ACCEPTABLE MANUFACTURERS. Acceptable manufacturers shall be as listed in the respective product description paragraphs.

2-4. MATERIALS.

2-4.01. Gas Vent Systems Gas vent systems shall be provided for all equipment that exhausts combustible material. Drain tee caps, stack caps, storm collars, and equipment connection kits shall be provided. The systems shall be designed to compensate for all flue gas-induced thermal expansions. Gas vent system materials and construction shall be in accordance with the vented equipment manufacturer's recommendations and instructions and to any local codes which pertain to such work.

2-4.02. Packaged Air Handling Units. Not used.

2-4.03. Furnaces.

Furnaces, denoted by the symbol "FUR" and an identifying number, shall be furnished and installed where indicated on the Drawings. Each unit shall be designed for indoor vertical or horizontal installation as indicated on the Drawings consisting of cabinet, heat exchanger, burner, coil, filter, drain pan, fan, and motor. Surfaces in contact with the airstream shall comply with the requirements of ASHRAE 62.1. The furnace manufacturer and model shall be Goodman GM95961004BU.

2-4.03.02. Performance and Design Requirements. The units shall be completely factory assembled and tested, piped, internally wired, and shipped in one piece. Each unit shall be non-condensing type with an efficiency rating of at least 80 percent AFUE. Each unit shall be designed for natural gas to meet the existing pressure range. The unit shall be suitable for the power supply and shall have the capacities indicated on the Drawings.

2-4.03.03. Cabinet. The unit shall be constructed of zinc-coated steel properly reinforced and braced for maximum rigidity. The unit shall be given a factory-applied coat of rust-inhibitive primer and shall be provided with the manufacturer's standard enamel finish. Interior surfaces of the unit shall have 1 inch [25 mm] thick, 1 pound [454 kg] density, insulation foil faced or coated on the air side. Removable panels shall be provided to permit easy inspection and maintenance.

2-4.03.04. Heating Section. The units shall be provided with gas heating section consisting of aluminized steel heat exchanger, combustion fan assembly, gas burner, 2-stage combination gas control valve, and operating/safety controls.

2-4.03.05. Fans and Motors. The indoor supply fan shall be a double inlet,

forward-curved, multiblade, centrifugal type statically and dynamically balanced by the unit manufacturer. The fan shall be direct or belt driven as indicated on the Drawings. Direct drive fans motors shall be multispeed with integral thermal-overload protection. Where belt driven fans are used, adjustable mounts and adjustable motor pulleys shall be provided.

Static pressure values indicated on the Drawings are external to the complete unit. Internal coil(s), filters and fan housing losses are not included. A filter allowance of 0.15 inch water column shall be used for 1 inch pleated filter losses and 0.35 inch water column shall be used for 2 inch pleated filter losses.

2-4.03.06. Filters. Filters shall be mounted integral within the unit and shall be 2 inches thick unless otherwise indicated on the Drawings. Filters shall conform to the requirements in the Air Filtration Equipment paragraph.

2-4.03.07. Controls. Controls shall include fan delay controls, electric ignition with flame safety to close the gas valve if the burner fails, roll-out safety control, and high limit controls. The fan delay thermal switch shall delay the fan start until the heat exchanger warms up and delay the fan shutdown until the heat exchanger cools down.

A thermostat for operation of the unit shall be furnished and installed as indicated on the Drawings. The thermostat shall be as needed to perform the sequence of operation as indicated on the Drawings. Thermostats shall be programmable wall mounted type and shall conform to the requirements of the Thermostats paragraph.

2-4.03.08. Accessories. Where indicated on the Drawings, a direct expansion cooling coil matched to the condensing unit/heat pump shall be installed on the unit. The cooling coil shall be multirow, seamless copper tubing mechanically bonded to heavy-duty aluminum fins installed in a case with the same finish as the furnace. The coil shall be factory pressure and leak tested to at least 300 psig or greater as needed for the system operating pressures. The coil shall be provided with expansion device or valve and filter-dryer. The coil section shall have fully insulated, sloped drain pan extending under the coil section and arranged to capture and collect any condensate including carryover that may be produced when the unit is operating within the specified operating conditions.

2-4.04. Makeup Air Units. Not used.

2-4.05. Heaters.

Heaters of the types, sizes, and capacities specified herein shall be furnished and installed where indicated on the Drawings. All heaters shall be complete with controls and accessories required for satisfactory operation. Heaters shall be UL listed unless otherwise indicated.

Heaters shall be completely factory wired and shall be provided with disconnecting backup and safety contactors, transformers, an automatic reset thermal cutout, a manual reset thermal cutout, a disconnect switch, and a differential pressure airflow switch. All interconnecting wiring shall be enclosed in a terminal box fastened to the heaters and oriented as indicated on the Drawings. The terminal boxes shall be furnished with double doors.

2-4.07. Roof Hoods. Not used.

2-4.08. Dampers.

2-4.08.01. Backdraft Dampers. Not used.

2-4.08.02. Control Dampers. Control dampers shall be denoted by the symbol "CD" and an identifying number. Dampers with an area larger than 25 square feet or with any blade dimension exceeding 48 inches shall be built in sections. All dampers shall be carefully inspected before and after installation, and any damper having poorly fitted blades, insufficient framed rigidity, or excessive clearance or backlash in moving parts will be rejected and shall be replaced with an acceptable unit. The leakage rate shall not exceed 4 cubic feet per minute per ft² when tested at 1 in wc for all sizes 24 inches wide and above.

Two-position dampers shall have parallel operating blades. Modulating dampers shall have opposed operating blades.

Damper blades shall be installed on a steel shaft operating in synthetic bearings suitable for industrial service. Dampers shall be close-fitting and shall be designed to offer minimum resistance to the airflow when in the fully open position. Damper blade linkage shall be concealed in the frame.

Control dampers shall be given a special coating identical to the coating applied to the connected ductwork and equipment.

- a. Duct Mounted Control Dampers. Control dampers mounted in ductwork and equipment curbs shall be Arrow United Industries "Type AFD-20" or Ruskin "CD-50". The damper frames shall be constructed of 5 inch Type 6063 T5 extruded aluminum. Damper blades shall be constructed of 6 inch wide airfoil-shaped extruded aluminum.
- b. Wall Mounted Control Dampers. Control dampers mounted in walls behind louvers shall be Arrow United Industries "Type AFD-20" or Ruskin "CD-40". Control damper frames shall be constructed of 4 by 1 inch 6063 T5 extruded aluminum. Damper blades shall be constructed of 4 inch wide airfoil-shaped extruded aluminum.

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- c. Round Control Dampers. Round control dampers shall be Arrow United Industries "Type 70, 75, or 80". The damper frames and blades shall be constructed of 0.080 inch aluminum.

2-4.08.03. Volume Control Dampers. Volume control dampers shall be denoted by the symbol "VCD".

Aluminum volume control dampers in round ductwork shall be Arrow United Industries "Type 75", or Ruskin "Model CDRS25". Volume control dampers in rectangular ductwork shall be Arrow United Industries "Type OBDPL-507", or Ruskin "Model CD51". Round dampers shall be fabricated of aluminum, with a nominal 7 inch [178 mm] long, 0.080 inch thick frame, and a minimum 0.080 inch thick circular blade. Rectangular volume control dampers shall be fabricated with a 1 by 4 or 5 inch by 0.081 inch thick extruded aluminum frame and opposed operating blades. Blades shall be of .125 inch thick aluminum with aluminum shafts and ball bearings.

The dampers shall be provided with adjustment quadrants and locking devices so arranged that the position of the damper will be indicated and the damper will not move when locked.

2-4.09. Damper Operators The damper operators shall be direct coupled or foot-mounted type. Each operator shall be complete with all necessary crank arms, ball joint connectors, push rods, linkages, and mounting brackets.

Each operator shall have sufficient torque to operate the connected control damper based on at least 130 percent of control damper area. Each damper operator shall have at least a 50 inch-pound [5.6 N-m] normal running torque. Where the required damper torque exceeds the damper operator running torque rating, multiple operators or operators with a greater running torque shall be furnished to produce the torque required to operate the damper. Control dampers shall fail to the closed position unless otherwise indicated on the Drawings. Face dampers shall fail to the closed position and bypass dampers to the open position.

2-4.10. Air Outlet and Inlet Devices. Air outlet and inlet devices shall be manufactured by Price, Tuttle & Bailey, or Titus. Air outlet and inlet devices shall be furnished and installed where indicated on the Drawings.

Where air outlet and inlet devices are installed in ductwork given a special coating, an identical coating shall be applied to the air outlet and inlet devices.

2-4.10.01. Ceiling Diffusers. Diffusers shall be square or rectangular, constructed of the materials indicated in the schedules on the Drawings. Diffusers shall have a key-operated, opposed-blade damper mounted in the neck where indicated in the schedules on the Drawings. Size, location, and direction

of airflow shall be as indicated on the Drawings.

2-4.10.02. Registers and Grilles. Registers and grilles shall be constructed of aluminum or steel as indicated in the schedules on the Drawings. The front blades of adjustable blade models shall be parallel to the short dimension unless otherwise indicated, and the front blades of fixed blade models shall be horizontal unless otherwise indicated. All registers shall be furnished with key-operated opposed blade dampers. The dampers shall be constructed of the same material as the attached grille.

2-4.11. Flexible Connections. Flexible connections located indoors shall be Ventfabrics "Ventglas". Flexible connections installed outdoors or exposed to sunlight or weather shall be Ventfabrics "Ventlon".

Ductwork connections to the air handling equipment, and where indicated on the Drawings, shall be made using fabric connectors with sheet metal collars. The fabric shall be fire resistant, waterproof, mildew-resistant, and airtight. At least 3 inches of fabric shall be exposed. Flexible connections shall be in accordance with the requirements of UL and NFPA.

Fabric for flexible connections protected from sunlight and the weather shall be suitable for a temperature range of -20 to 180°F and shall weigh at least 27 ounces per square yard.

Fabric for flexible connections exposed to sunlight or the weather shall be suitable for a temperature range of -10 to 250°F and shall weigh at least 24 ounces per square yard.

2-4.12. Air Filtration Equipment. Not used.

2-4.13. Draft Gauges. Not used.

2-4.14. Sheet Metal Ductwork. Ductwork, accessories, bracing, and supports shall be constructed of aluminum. Where more than one material is indicated, ductwork, accessories, bracing, and supports shall be constructed of galvanized steel unless otherwise indicated on the Drawings. Ductwork, turning vanes, and other accessories shall be fabricated in accordance with the latest SMACNA HVAC Duct Construction Standards unless otherwise indicated. Accessories, bracing, and supports shall be constructed of similar materials as the ductwork.

Galvanized ductwork located in air conditioned spaces shall be constructed of G-60 or better lockforming quality in accordance with ASTM A653. All other galvanized ductwork shall be constructed of G-90 or better galvanized steel. All welds on galvanized metal shall be cleaned and coated with a zinc-rich paint.

Plenums shall be constructed of reinforced 16 gage thickness galvanized sheet metal.

Sheet metal fan boxes shall be fabricated with 12 gage thickness galvanized sheet metal skin and structural steel framing of sufficient strength to support the fan box and the fan mounted on the box. Drawings of the fan boxes shall be submitted in accordance with the Submittals Procedures section.

Aluminum ductwork shall be constructed of aluminum alloy 3003-H14 or better in accordance with ASTM B209.

Plenums shall be constructed of reinforced 0.08 thickness aluminum sheet metal.

Sealants shall be suitable for the duct service and shall maintain leakage integrity at pressures in excess of the ductwork pressure classification.

2-4.15. Duct Insulation. Interior duct liner shall be Knauf "Sonic XP Duct Liner", CertainTeed "ToughGard R", or Johns Manville "Linacoustic RC".

Interior duct liner shall be 1-1/2 pound per cubic foot density, spray coated duct liner with an "R" value of at least $4.2 \text{ ft}^2 \text{ hr F/BTU}$ per inch thickness at 75°F. The insulation shall be suitable for temperatures up to 250°F and shall have at least a 0.55 NRC per 1 inch thickness. The insulation shall conform to ASTM C1071. The insulation surface shall be resistant to microbial growth in accordance with UL 181, ASTM C1338, or comparable test method and shall be cleanable in accordance with NAIMA recommended practices.

2-4.16. Flexible Duct and Takeoffs. Flexible duct shall be Thermafex "Type G-KM" or Flexmaster "Type 8". Takeoffs shall be Buckley Air Products "Air-Tite Bellmouth BM-D".

Flexible duct shall be a galvanized or vinyl-coated spring steel helix, bonded to a polymer liner, and wrapped with glass fiber insulation suitable for use in heating and cooling systems. The insulation shall provide an "R" value of at least $4.2 \text{ ft}^2 \cdot \text{hr}^\circ\text{F/BTU}$. The outer jacket shall be a vapor barrier of fire retardant polyolefin or polyethylene material. The flexible duct shall be listed under UL 181 as Class 1 flexible air duct and shall comply with the latest edition of NFPA 90A.

Takeoffs for the flexible duct shall be bellmouth type manufactured of the same material as the associate ductwork with a neoprene gasket and predrilled holes. Each takeoff shall be equipped with a balance damper constructed of 26 gage thickness galvanized steel. Scoops or other obstructions in the main duct will not be acceptable.

2-4.17. Access Doors. Not used.

2-4.18. Temperature Controls.

2-4.18.01. Performance and Design Requirements. Contractor shall coordinate with the Work to make certain that the field wiring associated with the work of this section is completed in accordance with the requirements of the heating, ventilating, and air conditioning equipment furnished and their interconnection. Where cable and conduit is not indicated on the Drawings but is needed for a complete and functional control system in accordance with the sequence of operation it shall be provided as specified herein. The control wiring shall be installed so that all HVAC equipment will function as described in the HVAC sequence of operation.

Conduit and control wiring for all control circuits needed between all field mounted HVAC controlling and indicating devices, such as, but not limited to, damper actuators, thermostats, temperature control panels, pressure differential switches, control switches, motor starters, and the HVAC equipment, shall be furnished and installed as specified in the Electrical Wiring paragraph. Cable and conduit for all HVAC power circuits shall be as specified in the Electrical section.

2-4.18.02. Tolerances. Unless otherwise indicated, the controls shall maintain space temperatures within $\pm 2^{\circ}\text{F}$, and the relative humidity within ± 5 percent of the setpoint.

2-4.18.10. Accessory Components. All additional control components, including, but not limited to, electric relays, temperature sensors and transmitters, humidity sensors and transmitters, controllers, and position switches, shall be furnished where necessary to ensure a complete, properly operating installation. All components shall be products of the temperature control manufacturer. Accessory components not mounted inside the temperature control panels shall be furnished with equipment enclosures. Relays shall be provided with 120 volt coils and at least 10 ampere contacts.

2-4.18.11. Electrical Wiring. Detailed wiring diagrams shall be submitted in accordance with the Submittals Procedures section. The wiring diagrams shall show the internal connections of the control panels and all field wiring to equipment remote from the control panels including wiring to Owner-furnished equipment. The wiring diagrams shall be complete, showing all connections necessary to place the temperature control systems in operation.

Control wiring shall be in accordance with the National Electric Code (NEC). Cable shall be multi-conductor, at least 18 AWG size, specifically designed for industrial systems and UL listed for indoor/outdoor installations.

Conduit for all HVAC control circuits in indoor locations shall be furnished and installed under this section. Conduit type shall be as specified in the Electrical Section.

2-5. ELECTRICAL. Electric motors and motor controls shall conform to the Basic Mechanical Building Systems Materials and Methods section. Motor starters and controls shall be furnished and installed under the Electrical section, except for equipment specified or furnished with prewired integral starters. Disconnects for equipment shall be furnished and installed under the Electrical section, except where specified with integral disconnects. All electrical controls shall have enclosures suitable for the environment and NEMA rating as indicated on the electrical Drawings. Equipment installed outdoors shall have NEMA Type 4 enclosures.

2-6. DRIVE UNITS. Electric motors, V-belt drives, and safety guards shall be in accordance with the requirements of the Basic Mechanical Building Systems Materials and Methods section.

2-7. MANUFACTURE AND FABRICATION. Manufacture and fabrication shall comply with the requirements of the Basic Mechanical Systems Materials and Methods section.

2-8. SHOP TESTING. The equipment furnished under this section shall be tested at the factory according to the standard practice of the manufacturer. Ratings shall be based on tests made in accordance with applicable AMCA, ASHRAE, AHRI, NBS, NFPA, and UL Standards.

2-9. BALANCE. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that the resonance at normal operating speeds is avoided. In any case, the maximum measured root-mean-square (rms) value as measured at any point on the equipment shall not exceed those listed in the latest ASHRAE Applications Handbook.

At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

PART 3 - EXECUTION

3-1. INSPECTION. Equipment installed in facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

Where penetrations through existing concrete slabs are made, the Contractor shall locate and avoid damage to all rebar, embedded conduit, etc. when making new openings.

3-2. PREPARATION.

3-2.01. Field Measurement. Contractor shall be responsible for verifying all field dimensions, and for verifying location of all equipment relative to any existing equipment or structures.

3-2.02. Surface Preparation. All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit, mud, oil, grease, rust, loose mill scale, or other objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner which will protect freshly painted surfaces from dust or other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted surfaces shall be dulled if necessary for proper adhesion of top coats.

Surface finish damaged during installation shall be repaired to the satisfaction of Engineer. Field painting shall be as specified in the Architectural Painting and Protective Coatings sections.

3-3. INSTALLATION. Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

Gas fired equipment furnished with pressure regulators that require a vent shall have an independent vent routed to outside. The vent shall be designed to prevent the entry of water or foreign objects.

The space beneath baseplates shall be grouted as specified in the Grouting section.

During construction, control measures as outlined in SMACNA IAQ Guidelines for Occupied Buildings under Construction shall be applied before the operation of any fan system.

3-3.01. Gas Vents. Gas vents for all equipment exhausting combustible material shall be installed where indicated on the Drawings. Gas vent systems shall be gastight to prevent leakage of combustible products into the building and shall be complete with all fittings, hangers, supports, and flashing necessary for proper installation.

Roof penetrations shall be flashed and counterflashed to provide a weathertight installation. The installation shall include, where necessary, ventilating collars to give proper clearance from floors, ceilings, and roofs constructed of combustible materials.

Gas vents shall be supported where indicated on the Drawings and where required by the system manufacturer. Supports, guides, and all appurtenances required for a complete system shall be furnished and installed at locations determined by the gas vent systems manufacturer. The entire system from the equipment connection to the termination, including accessories, shall be from one manufacturer.

The gas vent heights indicated on the drawing are minimum and shall be increased to conform to any local codes which pertain to such work.

All vertical gas vents shall be equipped with a capped tee to serve as a condensate drain. Vents 6 inches and larger shall be equipped with a condensate drain connection.

Where metal vents are used, each joint shall be sealed with sealant and/or aluminum or Teflon tape suitable for the operating temperatures to prevent leakage. The tape shall be wrapped two full turns around each joint. Where single wall metal vents are used to vent equipment, a double wall vent shall be used outside and shall extend through the wall a minimum of 6 inches [150 mm]. The annular space of the double wall vent shall be sealed at the connection point between the double and single wall pipes. Single wall vents routed through unconditioned spaces or in locations below 8 feet above the finished floor shall be insulated to prevent condensation or limit the cold face temperature to 150°F.

3-3.02. Packaged Air Handling Units. Not used.

3-3.03. Furnaces.

Units shall be installed level and with vibration isolators types where indicated on the Drawings. Flexible connections shall not be in tension when the fans are operating. Ductwork and piping installed adjacent to each unit shall not interfere with unit servicing or panel removal.

3-3.04. Makeup Air Units. Not used.

3-3.05. Heaters. Not used

3-3.06. Fans. Not used.

3-3.07. Roof Hoods. Not used

3-3.08. Damper Operators. Not used

3-3.09. Air Outlet and Inlet Devices. Air outlet and inlet devices shall be installed level and plumb and in accordance with the manufacturer's written instructions. Diffusers with balance dampers installed in the flexible duct takeoffs shall not have an opposed blade damper mounted in the throat of the diffuser. For devices installed in lay-in ceilings panels, the units shall be located in the center of the panel. Ceiling mounted air devices or services weighing 20 pounds or more shall be supported directly from the structure.

3-3.10. Draft Gauges. Not used

3-3.11. Sheet Metal Ductwork Ductwork, turning vanes, and other accessories shall be installed and supported in accordance with the latest SMACNA Duct Construction Standards unless otherwise indicated. The locations, arrangement, and sizes of ductwork shall be as indicated on the Drawings. The duct sizes indicated are clear dimensions inside the duct or duct lining. Sheet metal sizes are larger for ductwork with interior linings.

Ductwork shall be fabricated, reinforced, supported, and sealed for the operating pressures indicated in the schedules for the connected equipment. All ductwork shall have a pressure classification of at least 1 inch.

Sheet metal ductwork shall be sealed according to the classifications described in the SMACNA HVAC Duct Construction Standards in accordance with the following:

Duct Location	Duct Type			
	Supply		Exhaust	Return
	≤ 2 inches	> 2 inches		
Outdoors	wc A	wc A	A	A
Unconditioned Areas	B	A	B	B
Conditioned Spaces				
(concealed ductwork)	C	B	B	C
(exposed ductwork)	A	A	B	B

Sealing Levels

A - All transverse joints, longitudinal seams, and duct wall penetrations

B - All transverse joints and longitudinal seams

C - Transverse joints only

All joints, seams, connections, and penetrations in ductwork located outdoors shall be sealed watertight and weatherproof. Transverse joints shall be flanged and shall be provided with a continuous gasket and flange cap.

Ductwork shall be supported as required by SMACNA. Where ductwork is connected to equipment, it shall be independently supported with no weight

bearing on the equipment and in such a manner that the equipment maybe removed for service without temporary support of the ductwork. Ductwork shall be supported within 24 inches of each elbow and within 48 inches of each branch intersection. Strap or wire hangers shall not be used where the hanger length exceeds 5 feet.

Ductwork shall be constructed and installed in accordance with the Drawings. When acceptable to Owner, modifications in the size and location of ductwork may be made where required to avoid interference with the building structure, piping systems, or electrical work. The installation shall be coordinated with other phases of work to establish space and clearance requirements. Unless otherwise indicated by a bottom of duct elevation, all ductwork shall be routed as high as possible, with a minimum height of 8 feet above the finished floor. Ductwork installed above suspended ceilings shall be installed with at least 8 inch lighting allowance between the ceiling and the bottom of the ductwork.

In vertical ducts with a closed bottom which terminate less than 24 inches above finished floor, the bottom of the ductwork shall be broken and sloped to a 1/2 inch drain hole in the bottom of the duct.

Turning vanes shall be installed in all elbows with 45 degree or greater angles. Vanes shall be double thickness or a minimum 4.5 inch radius type for vanes 30 inches and longer, where installed in ducts with velocity greater than 2000 fpm, or where installed in ducts with a pressure classification greater than 2 inches wc. Where 4.5 inch or double thickness type turning vanes are required, each vane shall be welded to the vane runner.

3-3.12. Duct Insulation. Insulation materials shall be installed in accordance with the manufacturer's written instructions and recommendations. Surfaces which are to be insulated shall be cleaned and dried. Insulation shall be kept clean and dry and shall not be removed from the factory container until it is installed. Packages or factory containers shall have the manufacturer's stamp or label bearing the name of the manufacturer and description of the contents.

Insulation shall be terminated at items mounted in ductwork such as thermometers, controls, damper linkages, flexible connections, access doors, etc., to avoid interference with their function and/or replacement.

The duct liner in the corners of the duct sections shall be folded and compressed or shall be cut and fit to ensure overlapping, butted edges. Top and bottom pieces shall overlap the side pieces. Longitudinal seams shall be made only at corners unless duct dimensions and standard liner product dimensions make seams necessary at other locations.

The duct liner shall be held to the duct by a coat of waterproof, fire-retardant

adhesive applied over the entire duct surface. Where duct dimensions exceed 8 inches on any side, mechanical fasteners shall be used in addition to the adhesive. All exposed edges of the duct liner shall be tightly butted and coated with adhesive.

The following ducts shall be insulated with interior duct liner unless indicated on the Drawings to be wrapped or otherwise indicated:

<u>Location</u>	<u>Ductwork</u>	<u>Insulation Thickness</u>
Exterior	a. All ductwork	2 inches
Interior within conditioned space (heated or cooled)	a. Heating supply and return	1 inch
	b. Cooling supply and return	1 inch
	c. Heating and cooling supply and return	1 inch
	d. Makeup air outside area served	1 inch
	e. Outside air (including plenums)	1.5 inches
Interior within unconditioned space	a. Heating supply and return	1.5 inches
	b. Cooling supply and return	1.5 inches
	c. Heating and cooling supply and return	1.5 inches
	d. Makeup air outside area served	1.5 inches
	e. Outside air (including plenums)	2 inches
Note: Exhaust systems shall not be internally lined.		

3-3.13. Flexible Duct and Takeoffs. The length of the flexible ductwork shall not exceed 8 feet. All support saddles for flexible duct shall be a minimum of 6 inches wide.

3-3.14. Access Doors. Not used

3-3.15. Temperature Controls. Automatic temperature controls shall be furnished and installed as indicated on the Drawings and as specified herein.

3-4. FIELD QUALITY CONTROL.

3-4.01. Installation Check. An installation check by an authorized representative of the manufacturer is not required for equipment specified in this section

3-4.02. Startup and Testing. After the equipment and systems have been installed, adjusted, and balanced, tests shall be conducted to demonstrate that each system is functioning as specified and to the satisfaction of Engineer. Tests shall be as indicated in the Startup Requirements section.

If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable.

3-5. CLEANING. At the completion of the testing, all equipment, pipes, ductwork, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to Owner.

End of Section

Section 15650

REFRIGERATION SYSTEMS

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of refrigerant piping and accessories, ductless split systems, and appurtenances associated with the heating, ventilating, and air conditioning (HVAC) systems.

Piping, pipe supports, valves, and accessories which are not an integral part of the equipment or are not specified herein are covered in other sections.

1-2. GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

1-2.01. Coordination. Contractor shall verify that each component of the system is compatible with all other parts of the system; that all piping, ductwork, materials, fans, pumps, and motor sizes are appropriate; and that all devices necessary for a properly functioning system have been provided.

Where two or more units of the same class of equipment are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

1-2.02. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-2.03. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.04. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable

municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall comply with UL safety requirements.

The refrigerant systems shall be constructed in accordance with ASHRAE Standard 15. Refrigeration system equipment shall have a minimum efficiency of not less than specified in the latest edition of ASHRAE 90.1, unless otherwise indicated on the Drawings.

Capacity ratings for condensing units, heat pumps, packaged air conditioning units, and packaged heat pumps with capacities less than 135,000 BTUH shall be in accordance with AHRI Standard 210/240. For condensing units, heat pumps, packaged air conditioning units and packaged heat pumps with capacities over 135,000 BTUH the capacity ratings shall be in accordance with AHRI Standard 340/360.

1-2.05. Power Supply. Power supply to equipment with motors shall be as indicated in the schedules on the Drawings. Power supply for controls shall be 120 volts, 60 Hz, single phase unless otherwise indicated or required for a properly operating system.

1-2.06. Metal Thickness. Metal thickness and gauges specified herein are minimum requirements. Gauges refer to US Standard gauge.

1-2.07. Mechanical Identification. Mechanical identification shall conform to the requirements of the Basic Mechanical Building Systems Materials and Methods section.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete assembly and installation drawings, and wiring and schematic diagrams, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Submittals Procedures section. Device tag numbers indicated on the Drawings shall be referenced on the wiring and schematic diagrams where applicable. The data and specifications for each unit shall include, but shall not be limited to, the following:

Air Cooled Condensing Units/Heat Pumps

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

15650 – Refrigeration Systems

Locations and sizes of field connections.
Certified performance data and ratings.
Capacity and saturated suction temperature at specified conditions.
Equipment efficiency ratings.
Refrigerant type and charge.
Overall dimensions and required clearances.
Wiring diagrams with field and factory wiring clearly identified and electrical requirements.
Net weight and load distribution.
Where specified, information on equipment manufacturers' representatives.

Ductless Split System Heat Pumps

Name of manufacturer.
Type and model.
Construction materials, thickness, and finishes.
Location and sizes of field connections.
Certified performance data and ratings.
Capacity at specified conditions.
Refrigerant type and charge.
Overall dimensions and required clearances.
Multiline wiring diagrams with field and factory wiring clearly identified and electrical requirements.
Net weight and load distribution.
Where specified, information on equipment manufacturers' representatives

1-3.02. Operation and Maintenance Data and Manuals. Adequate operation and maintenance information shall be supplied as required in the Submittals Procedures section. Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

In addition to the requirements of the Submittals Procedures section, the operation and maintenance manuals shall include a listing of all filter locations, types, sizes, and quantities associated with each piece of equipment.

1-4. QUALITY ASSURANCE. Quality assurance shall comply with the requirements of the Basic Mechanical Building Systems Materials and Methods section.

1-5. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

1-6. EXTRA MATERIALS. Not used.

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. All equipment shall be designed and selected to meet the specified conditions.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS. Equipment and coil capacities shall be as indicated on the schedules. Where equipment is provided with special coatings, unit capacities shall be corrected to account for any efficiency losses from the selected special coating.

For equipment including fans, each fan's operating selection point on the fan curves shall be selected to the right of the peak pressure/efficiency point and below the lowest point along the fan curve, to the left of the peak pressure/efficiency point.

2-2.01. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract Drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Engineer. At least 3 feet of clear access space shall be provided on all sides of the unit unless otherwise indicated.

2-2.02. Elevation. Equipment shall be designed to operate at the elevation indicated in the Meteorological and Seismic Design Criteria section. All equipment furnished for sites above 2000 feet above sea level shall be properly derated to operate and meet the specified capacities at the site conditions.

2-3. ACCEPTABLE MANUFACTURERS. Acceptable manufacturers shall be as listed in the respective product description paragraphs.

2-4. MATERIALS.

2-4.01. Refrigerant Piping and Accessories. Refrigerant piping shall conform to the Copper Tubing and Accessories section. Piping shall be supported as

specified in the Pipe Supports section. Refrigerant filter dryers, expansion valves, solenoid valves, combination sight glass and moisture indicators, charging valves, relief valves, and other accessories shall be furnished and installed as needed for proper operation of the system.

2-5. EQUIPMENT.

2-5.01. Condensing Units.

Condensing units, denoted by the symbol "CU" and an identifying number and heat pumps denoted by the symbol "HP" and an identifying number, shall be furnished and installed where indicated on the Drawings. Each unit shall consist of compressor(s), condenser coil, condenser fan(s) and motor(s), starters, and all controls necessary for proper operation. Condensing units and heat pumps shall be manufactured by Trane, Carrier, McQuay, or York.

The manufacturer of the equipment provided shall have a local service center.

2-5.02. Room Air Conditioner. Not used.

2-5.03. Packaged Air Conditioning /Heat Pump Units. Not used.

2-5.04. Ductless Split Systems.

Ductless split systems shall be furnished and installed where indicated on the Drawings. Each unit shall include an indoor ceiling suspended fan coil section and an outdoor remote condensing unit/heat pump. Each unit shall be fully charged with R-410A and compressor oil. A programmable thermostat shall be provided for control of each system.

Ductless split systems shall be as manufactured by Mitsubishi, Daikin, Carrier, Friedrich, or equal.

2-5.04.01. Fan Coil. Each fan coil unit shall be of the ductless, indoor, under-ceiling mounted, direct expansion type. Each fan coil unit shall consist of a fan, evaporator coil, air filter, return grille, supply louver, mounting harness, and drain pan.

Fans shall be centrifugal type designed for quiet operation. Evaporator coils shall be copper tube with aluminum fins and galvanized steel tube sheets. The fins shall be bonded to the tubes by mechanical expansion. Air filters shall be of the cleanable type. Each unit shall be provided with access doors for easy removal of the filters. Each fan coil shall be provided with a mounting system and supports.

The fan coil fan shall be suitable for the power supply indicated on the Drawings.

2-5.04.02. Condensing Unit/Heat Pump. Each condensing unit/heat pump shall be factory assembled suitable for outdoor installation.

Each condensing unit shall have a galvanized steel cabinet that shall be bonderized and coated with a baked-enamel finish. The housing shall have removable panels, weep holes, and mounting holes. Compressors shall be high-efficiency, hermetically sealed reciprocating or scroll type with overload protection. Condenser coils shall consist of louvered aluminum fins mechanically bonded to copper tubing. Each unit shall be provided with resilient compressor vibration isolators to minimize noise. Each fan shall have a TEFC motor.

2-5.04.03. Accessories. Each unit shall be provided with an electric programmable thermostat capable of controlling all unit functions. The thermostat shall be automatic changeover type with integral sub-base.

Where indicated on the Drawings, an internal condensate pump shall be provided to remove condensate from the drain pan.

All copper surfaces shall be protected against corrosion by a shop applied special coating.

Each unit shall be provided with a low ambient control kit to allow operation when outdoor temperatures are between 0 and 60°F. External service valves and electrical knockouts shall be provided.

2-5.05. Water Chillers. Not used.

2-6. ELECTRICAL. Electric motors and motor controls shall conform to the Basic Mechanical Building Systems Materials and Methods section. Motor starters and controls shall be furnished and installed under the Electrical section, except for equipment specified or furnished with prewired integral starters. Disconnects for equipment shall be furnished and installed under the Electrical section, except where specified with disconnects. All electrical controls shall have enclosures suitable for the environment and NEMA rating as indicated on the electrical Drawings. Equipment installed outdoors shall have NEMA Type 4 enclosures.

2-7. DRIVE UNITS. Electric motors, V-belt drives, and safety guards shall be in accordance with the requirements of the Basic Mechanical Building Systems Materials and Methods section.

2-8. MANUFACTURE AND FABRICATION. Manufacture and fabrication shall comply with the requirements of the Basic Mechanical Systems Materials and Methods section.

2-9. SHOP TESTING. The equipment furnished under this section shall be tested at the factory according to the standard practice of the manufacturer. Ratings shall be based on tests made in accordance with applicable AMCA, ASHRAE, AHRI, NBS, NFPA, and UL Standards.

2-10. BALANCE. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that the resonance at normal operating speeds is avoided. In any case, the maximum measured root-mean-square (rms) value as measured at any point on the equipment shall not exceed those listed in the latest ASHRAE Applications Handbook.

At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

PART 3 - EXECUTION

3-1. INSPECTION. Equipment installed in facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

3-2. PREPARATION.

3-2.01. Field Measurement. Contractor shall be responsible for verifying all field dimensions, and for verifying location of all equipment relative to any existing equipment or structures.

3-2.02. Surface Preparation. All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit, mud, oil, grease, rust, loose mill scale, or other objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner which will protect freshly painted surfaces from dust or other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted surfaces shall be dulled if necessary for proper adhesion of top coats.

Surface finish damaged during installation shall be repaired to the satisfaction of Engineer. Field painting shall be as specified in the Protective Coatings section.

3-3. INSTALLATION. Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with the

drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

The space beneath the baseplate shall be grouted as specified in the Grouting section.

3-3.01. Valves. Valves shall be installed with their stems horizontal or vertical and above the valve body and with the applicable requirements of the valve sections.

3-3.02. Refrigerant Piping and Accessories. The refrigerant piping shall be sized and arranged in accordance with the manufacturer's recommendations. Pipe routing and isolation shall be selected to minimize vibration and transmission of sound to the conditioned space. The refrigerant piping system shall be provided with the necessary traps and risers for uniform return of oil to the compressor. The suction gas line shall be sized to produce a minimum load gas velocity of 1,000 feet per minute in vertical risers with upward gas flow and 500 feet per minute in horizontal piping. The full load pressure drop should not exceed 3 psi or 2°F change in saturated refrigerant temperature. The maximum gas velocity shall not exceed 4,000 feet per minute. The liquid lines shall be sized to limit the pressure loss to the equivalent of 2°F of temperature change and a maximum liquid line velocity of 360 feet per minute. A piping schematic indicating refrigerant piping sizes and corresponding velocities, accessories, accessory pressure losses, and piping pitch and direction shall be submitted in accordance with the Submittals section.

3-3.03. Condensing Units/Heat Pumps.

The condensing units and heat pumps shall be installed in accordance with the manufacturer's installation instructions. Each unit shall be leveled and installed to maintain the manufacturer's recommended clearances. The units shall be firmly anchored where indicated on the Drawings.

After the refrigerant system has been tested, the system shall be fully charged with refrigerant and compressor oil.

The installation shall be checked by the manufacturer in accordance with the Installation Check paragraph.

3-3.04. Packaged Air Conditioning Units/Packaged Heat Pumps. Not used.

3-3.05. Ductless Split Systems.

Ductless split systems shall be installed in accordance with the manufacturer's installation instructions. Each unit shall be leveled and installed to maintain the recommended clearances.

3-4. FIELD QUALITY CONTROL.

3-4.01. Installation Check. An installation check by an authorized representative of the manufacturer is not required for equipment specified in this section

3-4.02. Startup and Testing. After the equipment and systems have been installed, adjusted, and balanced, tests shall be conducted to demonstrate that each system is functioning as specified and to the satisfaction of Engineer. Tests shall be as indicated in the Startup Requirements section.

If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable

3-4.03. Operator Instruction and Training. Not used

3-5. CLEANING. At the completion of the testing, all equipment, pipes, ductwork, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to Owner.

End of Section

Section 15990

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1-1. SCOPE. This section covers the cleaning, testing, adjusting, and balancing of the air system(s) associated with the heating, ventilating, and air conditioning (HVAC).

1-2. GENERAL. Equipment and systems shall be cleaned, tested, adjusted, and balanced in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

1-2.01. Coordination. Contractor shall verify that all components and devices necessary for a properly functioning system have been provided. Prior to cleaning, testing, adjusting, and balancing, Contractor shall verify that each system has been installed properly and is operating as specified. Equipment bearings shall be lubricated in accordance with the manufacturer's recommendations.

Air systems shall be complete and operating, with dampers, filters, ductwork, air outlet and inlet devices, duct mounted equipment, and control components.

1-2.02. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall comply with the latest edition of AABC, NEBB, or SMACNA standard manuals for testing, adjusting, and balancing of air systems.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete apparatus report sheets for all air systems shall be accurately and completely filled out in accordance with the Standard's manual. The testing and balancing results shall be submitted on the TAB report forms of the applicable standard. Copies of the final test readings and report sheets shall be submitted in accordance with the Submittals Procedures section. A description of the standard procedures used during testing, adjusting, and balancing shall be included in the submittal. The submittal shall include a reduced set of drawings, with the air outlet devices, air inlet devices, and equipment identified to correspond with the report sheets. Test

dates shall be recorded on the individual TAB report forms indicating when the actual testing was performed.

The apparatus report sheets shall include the following information:

1. Title Page:
 - a. Company name
 - b. Company address
 - c. Company telephone number
 - d. Project name
 - e. Project location
 - f. Project Engineer
 - g. Project Contractor
 - h. Project altitude
 - i. Date
2. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model
 - d. Serial number
 - e. Range
 - f. Calibration date
3. Air Moving Equipment: Not used.
4. Electric Motors:
 - a. Manufacturer
 - b. Motor type and frame
 - c. HP/BHP
 - d. Phase, voltage, amperage, nameplate, actual, no load.
 - e. RPM
 - f. Service factor
 - g. Starter size, rating, heater elements
5. V-Belt Drive: Not used.
6. Return Air/Outside Air Data: Not used.
7. Coil Data: Not used.
8. Duct Traverse: Not used.
9. Outlet and Inlet Devices:
 - a. Air outlet and inlet device number
 - b. Room number/location
 - c. Air outlet and inlet device type
 - d. Air outlet and inlet device size
 - e. Area factor
 - f. Velocity, design, preliminary, and final
 - g. Air flow, design, preliminary, and final
 - h. Percent of design airflow
10. Sound Level Report: Not used.

11. Package Air Conditioning/Heat Pump Unit. Not used.
12. Air Terminal Unit Data: Not used.
13. Electric Duct Heater: Not used.
14. Air Cooled Condenser/Heat Pump:
 - a. Unit number
 - b. Location
 - c. Manufacturer and model
 - d. Refrigerant type and capacity
 - e. Entering DB air temperature, design and actual
 - f. Leaving DB air temperature, design and actual
 - g. Number of compressors
 - h. Suction pressure and temperature
 - i. Condensing pressure and temperature
15. Chillers: Not used.
16. Pump Data: Not used.
17. Heat Exchanger: Not used
18. Combustion Test: Not used

1-4. QUALITY ASSURANCE. Contractor shall provide the services of a licensed independent contractor, certified by AABC, NEBB, or TABB and with proven experience on at least three similar projects, to perform operational testing, adjusting, and balancing of the air systems. The work shall be performed in accordance with the latest edition of the procedural standards as published by the National Organization associated with the testing, adjusting, and balancing contractor.

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. All equipment shall be adjusted or balanced to meet the specified conditions and to operate at the elevation indicated in the equipment sections.

2-2. CONSTRUCTION.

2-2.01. Painting. Surface finish damaged during cleaning, testing, adjusting, and balancing of equipment shall be repaired to the satisfaction of Engineer. Field painting shall be as specified in the Architectural Painting and Protective Coatings sections.

PART 3 - EXECUTION

3-1. INSPECTION. Before testing and balancing the air system, doors and windows surrounding the area served by the system shall be closed. Fans shall be checked for correct rotation and rotative speed. Dampers shall be open and access doors and panels shall be closed during the testing and balancing period.

3-2. STARTUP REQUIREMENTS. System equipment shall be subject to preliminary field tests as indicated in Startup Requirements section.

3-3. FIELD PERFORMANCE TESTING. Field performance tests shall be conducted for each system to demonstrate each is functioning as specified and to the satisfaction of Engineer. All tests shall be conducted in a manner acceptable to Engineer and shall be repeated as many times as necessary to secure Engineer's acceptance of each system. If inspection or tests indicate defects, the defective item or material shall be replaced, and the inspection and tests shall be repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable.

3-3.01. Hydronic Piping. Not used.

3-3.02. Refrigerant Piping. The refrigerant piping system shall be tested in accordance with ANSI/ASME B31.5.

After testing of the refrigerant piping system is completed, the system shall be charged with the proper refrigerant and placed in operation.

The completed refrigerant system shall be guaranteed to be sufficiently free from leaks for 1 year from the date of acceptance. The loss of refrigerant shall not exceed 5 percent over that period.

3-4. CLEANING. At the completion of the testing, all parts of the installation shall be thoroughly cleaned. All equipment, ductwork, pipes, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to Owner.

3-4.01. Chemical Pipe Cleaning. Not used

3-4.01.01. Heating Water System. Not used

3-4.01.02. Chilled and Condenser Water Systems. Not used.

3-5. ADJUSTING & BALANCING The air system shall be adjusted and balanced.

All instrumentation shall be calibrated in accordance with the governing standard manual and shall be checked for accuracy before testing, adjusting, and balancing the systems. The accuracy of the instrumentation shall be not less than specified by the testing, adjusting, and balancing standard manual or the instrument manufacturer.

All data, including system deficiencies encountered and corrective measures taken, shall be recorded. If a system cannot be adjusted to meet the design requirements, Contractor shall notify Engineer in writing as soon as practicable.

Following final acceptance of the certified balancing reports, the testing and balancing contractor shall permanently mark the settings of all adjustment devices, including valves and dampers, and shall lock the memory stops.

All ceiling tiles, belt guards, panels, and doors removed during testing, adjusting, and balancing shall be reinstalled.

3-5.01. Air Systems. Air systems shall be adjusted to the design airflows indicated on the Drawings. Airflows shall be adjusted to maintain a net positive (supply airflow greater than exhaust airflow) or negative (exhaust airflow greater than supply airflow) pressure as indicated on the Drawings. Dampers located behind air outlet and inlet devices shall be used to adjust the airflow only to the extent that the adjustments do not create objectionable air movement or noise. Fans shall not be adjusted above the maximum safe speed as determined by the fan manufacturer.

Dampers with operators shall be checked for tight shutoff when in the closed position. Shutoff dampers shall not be used for balancing.

End of Section

Section 16050

ELECTRICAL

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of all equipment and materials needed for the electrical requirements of this Contract. It also covers conduit, wiring, and terminations for electrical equipment installed under Electrical Equipment Installation section.

This section covers the installation and interconnection of electrical equipment furnished under other sections, except electrical items designated to be installed under those sections.

1-2. GENERAL. Electrical apparatus on all equipment shall be installed complete and placed in readiness for proper operation.

Electrical materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations section shall apply to all equipment provided under this section. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence.

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Coordination. Electrical work shall conform to the construction schedule and the progress of other trades.

1-2.04. Anchor Bolts and Expansion Anchors. All anchor bolts, nuts, washers, and expansion anchors shall comply with Anchorage in Concrete and Masonry section, except smaller than 3/4 inch will be permitted to match NEMA standard size bolt holes on motors and electrical equipment.

1-2.05. Drawings. Supplementing this section, the Drawings indicate locations of equipment and enclosures and provide one-line and schematic diagrams regarding the connection and interaction with other equipment.

1-3. CODES AND PERMITS. All work shall be performed and materials shall be furnished in accordance with the NEC - National Electrical Code, the NESC - National Electrical Safety Code, and the following standards where applicable:

AEIC	The Association of Edison Illuminating Companies
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
Fed Spec	Federal Specification
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
NEIS	National Electrical Installation Standards
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters' Laboratories

Equipment covered by this section shall be listed by UL.

1-4. SEISMIC DESIGN REQUIREMENT.

1-4.01. Seismic Design Requirements. Submit confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-5. IDENTIFICATION.

1-5.01. Conduit. Conduits in manholes, handholes, building entrance pull boxes, junction boxes, and equipment shall be provided with identification tags. Identification tags shall be 19 gage stainless steel, with 1/2 inch stamped letters and numbers as indicated on the Drawings. Identification tags shall be attached to conduits with nylon tie wraps and shall be positioned to be readily visible.

1-5.02. Conductors. All conductors in power, control, and instrumentation circuits shall be identified and color coded as described herein.

1-5.02.01. Conductor Identification Number. Except for lighting and receptacle circuits, each individual conductor in power, control, and instrumentation circuits shall be provided with wire identification markers at the point of termination.

The wire markers shall be of the heat-shrinkable tube type, with custom typed identification numbers.

The wire numbers shall be as indicated on the equipment manufacturer's drawings.

The wire markers shall be positioned to be readily visible for inspection.

1-5.02.02. Conductor Color Coding. Power conductors shall be color coded as indicated below. For conductors 6 AWG and smaller, the color coding shall be the insulation finish color. For sizes larger than 6 AWG, the color coding may be by marking tape. The equipment grounding conductor shall be green or green with one or more yellow stripes if the conductor is insulated.

The following color coding system shall be used:

120/240 V, single-phase — black, red, and white
120/208 V, three-phase — black, red, blue, and white
277/480 V, three-phase — brown, orange, yellow, and gray

1-5.03. Motor Starters. Not used.

1-5.04. Control Stations. Not used.

1-5.05. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the circuit breakers.

1-5.06. Disconnect Switches. All switches shall have front cover-mounted permanent nameplates that include switch type, manufacturer's name and catalog number, and horsepower [kW] rating. An additional nameplate, engraved or etched, laminated black-over-white plastic, with 1/8 inch letters, shall be provided to identify the associated equipment. Both nameplates shall be securely fastened to the enclosure.

1-5.07. Arc Flash Hazard Labels. Lighting panels, power panels, power centers, switchgear, switchboards, motor control centers, motor control line ups, transfer switches, industrial control panels, adjustable frequency drives, fused switches, meter socket enclosures, and other electrical equipment likely to be worked on energized shall be provided with permanent labels warning the risk of arc flash and shock hazard. Labels shall be designed in accordance with ANSI Z535.4 and shall include the following:

WARNING
Arc Flash and Shock Hazard

Appropriate personal protection equipment (PPE) required. SEE NFPA 70E.
Equipment must be accessed by qualified personnel only.
Turn off all power sources prior to working on or inside equipment.

Additional information shall be provided on the labels where specified in the Arc Flash Hazard Analysis section of this section.

1-6. SUBMITTALS. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the work performed by the Contractor, shall be submitted in accordance with the Submittal Procedures section. The drawings and data shall include, but shall not be limited to, the following:

- Drawings and data.
- Operating manuals.
- Samples.
- Test reports
- Studies

1-6.01. Submittal Identification. Information covering all materials and equipment shall be submitted for review in accordance with the Submittal Procedures section. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment as follows:

- a. Lamp fixture descriptive sheets shall show the fixture schedule letter, number, or symbol for which the sheet applies.
- b. Equipment and materials descriptive literature and drawings shall show the specification paragraph for which the equipment applies.
- c. Sheets or drawings covering more than the item being considered shall have all inapplicable information crossed out.
- d. A suitable notation shall identify equipment and materials descriptive literature not readily cross-referenced with the Drawings or Specifications.
- e. Schematics and connection diagrams for all electrical equipment shall be submitted for review. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted, unless it is clearly marked to show the intended connections.

- f. Surge protective device submittals shall include drawings (including unit dimensions, weights, component and connection locations, mounting provisions, and wiring diagrams), equipment manuals that detail the installation, operation and maintenance instructions for the specified unit(s), and manufacturer's descriptive bulletins and product sheets.

Contractor shall submit the name and qualifications of the Engineering and Testing Services firm proposed to perform the protective device study and the on-site testing.

Within 90 days after the Notice to Proceed, Contractor shall furnish a submittal for all types of cable and conduit to be provided. The submittal shall include the cable manufacturer and type, and sufficient data to indicate that the cable and conduit meet the specified requirements.

In addition to the complete specifications and descriptive literature, a sample of the largest size of each type of cable shall be submitted for review before installation. Each sample shall include legible and complete surface printing of the cable identification.

1-6.02. Seismic Design Requirements. Submitted confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-7. PROTECTION AND STORAGE. During construction, the insulation on all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion by strip heaters, lamps, or other suitable means. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously.

PART 2 - PRODUCTS

2-1. POWER SERVICE ENTRANCE. Not used.

2-2. TELEPHONE SERVICE ENTRANCE. Not used.

2-3. CABLE. All cables of each type (such as lighting cable or 600 volt power cable) shall be from the same manufacturer.

All types of cable shall conform to the Cable Data Figures at the end of this section and as described herein.

2-3.01. Lighting Cable. Lighting cable (Figure 1-16050 THHN-THWN) shall be provided only in lighting and receptacle circuits operating at 277 volts or less. Lighting and receptacle circuits, 8 AWG or larger, shall be as specified for 600 volt (Figure 2-16050 XHHW-2) power cable.

2-3.02. 600 Volt Power Cable. Cable in power, control, indication, and alarm circuits operating at 600 volts or less, except where lighting, multiconductor control, and instrument cables are required, shall be 600 volt (Figure 2-16050 XHHW-2) power cable.

2-3.03. Instrument Cable. Cable for electronic circuits to instrumentation, metering, and other signaling and control equipment shall be two- or three-conductor instrument cable twisted for magnetic noise rejection and protected from electrostatic noise by a total coverage shield. Types of instrument cables shall be (Figure 4-16050 single pair).

2.3.04. Multiconductor Control Cable. When indicated on the Drawings, cable in control, indication and alarm circuits shall be multiconductor. Cable shall be (Figure 7-16050 14 AWG THHN-THWN).

2-3.05. Medium Voltage Power Cable. Not used.

2-3.06. Tray Cable. Not used.

2-3.07. Metal Clad Lighting Cable. Not used.

2-4. CONDUIT/RACEWAY. Conduit and raceways shall be as described in the following paragraphs:

2-4.01. Rigid Steel Conduit. Rigid steel conduit shall be heavy wall, hot-dip galvanized, shall conform to NEMA C80.1, and shall be manufactured in accordance with UL 6.

2-4.02. Intermediate Metal Conduit (IMC). Not used.

2-4.03. Liquidtight Flexible Metal Conduit. Not used.

2-4.04. Utility (PVC) Duct. Not used.

2-4.05. Rigid Nonmetallic (PVC) Conduit. PVC conduit shall be heavy wall, Schedule 40, UL labeled for aboveground and underground uses, and shall conform to NEMA TC-2 and UL 651.

2-4.06. PVC-Coated Rigid Steel Conduit. The conduit shall be rigid steel. Before the PVC coating is applied, the hot-dip galvanized surfaces shall be coated with a primer to obtain a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit. The bond on conduit and fittings shall be stronger than the tensile

strength of the PVC coating. The thickness of the PVC coating shall be at least 40 mils.

A chemically cured two-part urethane coating, at a nominal 2 mil thickness, shall be applied to the interior of all conduit and fittings. The coating shall be sufficiently flexible to permit field bending the conduit without cracking or flaking of the coating.

Every female conduit opening shall have a PVC sleeve extending one conduit diameter or 2 inches, whichever is less, beyond the opening. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit before coating. The wall thickness of the sleeve shall be at least 40 mils.

All fittings, condulets, mounting hardware, and accessories shall be PVC-coated. All hollow conduit fittings shall be coated with the interior urethane coating described above. The screw heads on condulets shall be encapsulated by the manufacturer with a corrosion-resistant material.

PVC coated rigid steel conduit shall be manufactured by Perma-cote, Ocal, or Robroy.

2-4.07. Electrical Metallic Tubing (EMT). EMT shall be hot-dip galvanized, shall conform to NEMA C80.3, and shall be manufactured in accordance with UL 797. EMT shall only be allowed at Rocky Branch and Fishing River Control Rooms.

2-4.08. Rigid Aluminum Conduit (RAC). Not used.

2-4.09. Cable Tray. Not used.

2-5. WIRING DEVICES, BOXES, AND FITTINGS. Concealed conduit systems shall have flush-mounted switches and convenience outlets. Exposed conduit systems shall have surface-mounted switches and convenience outlets.

2-5.01. Conduit Boxes and Fittings.

- a. Galvanized or cadmium plated, threaded, malleable iron boxes and fittings shall be manufactured by Crouse-Hinds, Appleton, or O Z Gedney. In applications utilizing aluminum conduit systems, aluminum boxes and fittings manufactured by Crouse-Hinds, Appleton, or O Z Gedney shall be installed.
- b. Rigid PVC device boxes and fittings shall be manufactured by Carlon or Cantex.

- c. Sheet steel device boxes shall be manufactured by Appleton, Raco, or Steel City.
- d. PVC coated device boxes shall be manufactured by Calbond, Ocal, or Robroy Industries.
- e. Hub arrangements on threaded fittings shall be the most appropriate for the conduit arrangement to avoid unnecessary bends and fittings.

2-5.02. Device Plates.

- a. Device plates on flush mounted outlet boxes where weatherproof plates are not required shall be AISI Type 302 stainless steel, Eaton "93000 series", Hubbell "S series", or Leviton "840nn-40 series"; nylon or polycarbonate, Eaton "5000 series", Hubbell "Pn series", or Leviton "807nn-I series".
- b. Device plate mounting hardware shall be countersunk and finished to match the plate.
- c. Device plates for switches outdoors or indicated as weatherproof shall have provisions for padlocking switches "On" and "Off", and shall be Appleton "FSK-1VS", Crouse-Hinds "DS185" or O Z Gedney "FS-1-WSCA".
- d. Device plates for receptacles indicated as weatherproof shall be Appleton "FSK-WRD", Crouse-Hinds "WLRD1", or O Z Gedney "FS-1-WDCA".
- e. Flush-mounted, weatherproof plates shall be provided with adapter plates, Appleton "FSK-SBA" or Crouse-Hinds "FS031".
- f. Device plates for ground fault interrupter receptacles indicated to be weatherproof shall be Appleton "FSK-WGFI", Eaton "S966", or O Z Gedney "FS-1-GFCA".
- g. Receptacle covers outdoors or otherwise indicated to be weatherproof while in-use shall be die cast aluminum and shall include a padlock eye. Covers for standard convenience outlets shall be Hubbell "WP8M" or Thomas and Betts Red Dot "CKMUV". Covers for ground fault interrupter receptacles shall be Hubbell "WP26M" or Thomas and Betts Red Dot "CKMUV".
- h. Engraved device plates, where required, shall be manufactured by Leviton, or equal.
- i. Device plates on PVC conduit fittings shall be Carlon "E98 Series" or Cantex "513300 Series".

2-5.03. Wall Switches.

- a. Switches on ac lighting panel load circuits through 277 volts shall be 20 amperes, 120/277 volts, Eaton "AH1221V" through "AH1224V", Hubbell "HBL 1221I" through "HBL 1224I", or Leviton "1221-2I" through "1224-2I", unless noted otherwise.

2-5.04. Receptacles.

- a. Standard convenience outlets shall be duplex, three-wire, grounding, 20 amperes, 125 volts, Eaton "AH5362V", Hubbell "5362I" or Leviton "5362-I" for 120 volt circuits, and 250 volts, Eaton "AH5462CV", Hubbell "5462I" or Leviton "5462-I" for 240 volt circuits.
- b. Ground fault circuit interrupter receptacles shall be duplex, 20 amperes, 125 volts, Eaton "SGFH20", Hubbell "GFRST20I" or Leviton "G5362-I".
- c. Ground fault circuit interrupter receptacles in damp or wet locations shall be duplex, 20 amperes, 125 volts, Hubbell "GFWRST20I" or Leviton "G5362-WTI".

2-5.05. Special Outlets. Not used.

2-6. JUNCTION BOXES, PULL BOXES, AND WIRING GUTTERS. Indoor boxes (larger than switch, receptacle, or fixture type) and gutters shall be constructed of sheet steel, shall be galvanized after fabrication, and shall be rigidly supported by hot-dip galvanized hardware and framing materials, including nuts and bolts.

Indoor boxes and gutters in corrosive areas indicated on the Drawings and outdoor boxes and gutters shall be NEMA Type 4X, ABS or stainless steel and shall be rigidly supported by PVC-coated or stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

Bolt-on junction box covers 3 feet square or larger, or heavier than 25 lbs, shall have rigid handles. Covers larger than 3 by 4 feet shall be split.

Where indicated on the Drawings, junction and pull boxes with a removable side opposite the underground conduits shall be provided over building ends of underground conduit banks. Boxes shall be sized in accordance with the National Electrical Code, including space for full size continuations of all

underground conduits not originally continued. Conduit arrangement shall leave maximum space for future conduits.

2-7. LIGHTING FIXTURES. Lighting fixtures shall be furnished as described in the fixture schedule and as indicated on the Drawings. Lighting fixtures shall be furnished complete with lamps. Pendant fixtures shall have swivel type box covers and threaded conduit pendants unless otherwise specified. Lighting fixtures shall be provided with disconnects in accordance with NEC requirements.

2-7.01. Electronic Drivers. Electronic drivers furnished with LED type lighting fixtures shall be certified as meeting requirements of ANSI C82.77 with a THD level of not more than 20 percent.

2-8. LIGHTING PANELS. Not used.

2-9. POWER PANELS. Not used

2-10. SURGE PROTECTIVE DEVICES. Not used.

2-11. SEPARATELY ENCLOSED MOTOR STARTERS. Not used.

2-12. SEPARATELY ENCLOSED MANUAL STARTERS. Not used.

2-13. CONTROL STATIONS. Not used.

2-14. SEPARATELY ENCLOSED CIRCUIT BREAKERS. Not used.

2-15. DISCONNECT SWITCHES. Unless otherwise specified, each disconnect switch shall be 3 pole, non-fusible, 600 volts, with a continuous current rating as indicated on the Drawings.

Switches located indoors shall have NEMA type enclosure designations as required by the locations where they will be installed. Switches located outdoors shall have NEMA Type 4X stainless steel enclosures. Switches in chlorine rooms, or in other areas where contact with caustic substances may occur, shall have NEMA Type 4X stainless steel enclosures of molded reinforced polyester.

Switches shall have high conductivity copper, visible blades; non-teasible, positive, quick-make, quick-break mechanisms; and switch assembly plus operating handle as an integral part of the enclosure base. Each switch shall have a handle whose position is easily recognizable and which can be locked in the "Off" position with three padlocks. The "On" and "Off" positions shall be clearly marked.

All switches shall be UL listed and horsepower [kilowatt] rated, and shall meet the latest edition of NEMA KS1. Switches shall have defeatable door interlocks that prevent the door from being opened while the operating handle is in the "On" position.

2-16. LIGHTING AND AUXILIARY POWER TRANSFORMERS. Not used.

2-17. POWER CENTERS. Not used.

2-18. POWER FACTOR CORRECTION CAPACITORS. Not used.

2-19. LIGHTING CONTACTORS. Not used.

2-20. PHOTOELECTRIC CONTROLS. Not used.

2-21. RELAY ENCLOSURES. Not used.

2-22. ALARM HORN AND BEACON. Not used.

2-23. HEAT-TRACED PIPING. Not used.

2-24. DOOR ENTRY SWITCHES. Not used.

PART 3 - EXECUTION

3-1. INSTALLATION, TESTING, AND COMMISSIONING. All material, equipment, and components specified herein shall be installed, tested, and commissioned for operation in compliance with NECA 1000 – NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

3-2. ARC FLASH HAZARD ANALYSIS. [Not used.]

3-3. PROTECTIVE DEVICE STUDY. Not used.

3-4. POWER AND SERVICE ENTRANCE INSTALLATION. Not used.

3-5. TELECOMMUNICATIONS SERVICE ENTRANCE INSTALLATION. Not used.

3-6. CABLE INSTALLATION.

3-6.01. General. Except as otherwise specified or indicated on the Drawings, cable shall be installed according to the following procedures, taking care to protect the cable and to avoid kinking the conductors, cutting or puncturing the jacket, contamination by oil or grease, or any other damage. Circuits to supply electric power and control to equipment and devices, communication and signal

circuits as indicated on the one-line diagrams shall be installed continuous and may not be spliced unless approved by the Engineer.

- a. Stranded conductor cable shall be terminated by lugs or pressure type connectors. Wrapping stranded cables around screw type terminals is not acceptable.
- b. Stranded conductor cable shall be spliced by crimp type connectors. Twist-on wire connectors may only be used for splicing solid cable and for terminations at lighting fixtures.
- c. Splices may be made only at readily accessible locations.
- d. Cable terminations and splices shall be made as recommended by the cable manufacturer for the particular cable and service conditions.
- e. Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.
- f. Cable-pulling lubricant shall be compatible with all cable jackets; shall not contain wax, grease, or silicone; and shall be Polywater "Type J".
- g. Where necessary to prevent heavy loading on cable connections, in vertical risers, the cable shall be supported by Kellems, or equal, woven grips.
- h. Spare cable ends shall be taped, coiled, and identified.
- i. Cables shall not be bent to a radius less than the minimum recommended by the manufacturer. For cables rated higher than 600 volts, the minimum radius shall be 8 diameters for nonshielded cable and 12 diameters for shielded cable.
- j. All cables in one conduit, over 1 foot long, or with any bends, shall be pulled in or out simultaneously.
- k. Circuits to supply electric power and control to equipment and devices are indicated on the one-line diagrams. Conductors in designated numbers and sizes shall be installed in conduit of designated size. Circuits shall not be combined to reduce conduit requirements unless acceptable to Engineer.
- l. Instrument cable shields and drain wires shall be continuous over the entire length of the circuit and grounded at one end only. In general, the field end of the shield shall be ungrounded. At the ungrounded termination of the circuit, the shield and drain wire shall be insulated by taping to prevent grounding.

3-6.02. Underground Cable Pulling Procedure. Care shall be taken to prevent excessive physical stresses that would cause mechanical damage to cables during pulling. Before pulling cables into the underground duct system the Contractor shall submit a pulling procedure for all circuits.

The procedure shall include the following information:

- a. Point of cable entrance into the duct system.
- b. Point of cable exit from the duct system.
- c. Type of cable grip to be used.
- d. Type of pulling device to be used.
- e. Method of continuously monitoring cable tension during pulling.
- f. Identification of manholes through which cable will be pulled or where splices will be made.
- g. Size and type of cable sheave assemblies to be used.

3-6.03. Medium-Voltage Cable Insulation Test. Not used.

3-7. CONDUIT/RACEWAY INSTALLATION. Contractor shall be responsible for routing all raceway. This shall include all conduits indicated on the one-lines, riser diagrams, and home-runs shown on the plan Drawings. Conduits shall be routed as defined in these Specifications. Where conduit routing is shown on plans, it shall be considered a general guideline and shall be field verified to avoid interferences.

Except as otherwise specified or indicated on the Drawings, conduit installation and identification shall be completed according to the following procedures.

3-7.01. Installation of Interior and Exposed Exterior Conduit. This section covers the installation of conduit inside structures, above and below grade, and in exposed outdoor locations. In general, conduit inside structures shall be concealed. Large conduit and conduit stubs may be exposed unless otherwise specified or indicated on the Drawings. No conduit shall be exposed in water chambers unless so indicated on the Drawings.

Unless otherwise indicated on the Drawings, Contractor shall be responsible for routing the conduit to meet the following installation requirements:

- a. Conduit installed in all exposed indoor locations and in floor slabs, walls, and ceilings of hazardous (classified) locations, shall be rigid steel. Exposed conduit shall be rigidly supported by hot-

dip galvanized hardware and framing materials, including nuts and bolts.

- b. Conduit installed in floor slabs and walls in non-hazardous locations shall be rigid Schedule 40 PVC.
- c. Conduit installed in all exposed outdoor locations shall be PVC-coated rigid steel, rigidly supported by PVC-coated framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.
- d. Final connections to dry type transformers, to motors without flexible cords, and to other equipment with rotating or moving parts shall be liquidtight flexible metal conduit with watertight connectors installed without sharp bends and in the minimum lengths required for the application, but not longer than 6 feet unless otherwise acceptable to Engineer.
- e. Terminations and connections of rigid steel and intermediate metal conduit shall be taper threaded. Conduits shall be reamed free of burrs and shall be terminated with conduit bushings.
- f. Exposed conduit shall be installed either parallel or perpendicular to structural members and surfaces.
- g. Two or more conduits in the same general routing shall be parallel, with symmetrical bends.
- h. Conduits shall be at least 6 inches from high temperature piping, ducts, and flues.
- i. Rigid Schedule 40 PVC conduit shall have supports and provisions for expansion as required by NEC Article 352.
- j. Metallic conduit connections to sheet metal enclosures shall be securely fastened by locknuts inside and outside.
- k. Rigid Schedule 40 PVC conduit shall be secured to sheet metal device boxes using a male terminal adapter with a locknut inside or by using a box adapter inserted through the knockout and cemented into a coupling.
- l. Conduits in walls or slabs, which have reinforcement in both faces, shall be installed between the reinforcing steel. In slabs with only a single layer of reinforcing steel, conduits shall be placed under the reinforcement. Conduits larger than 1/3 of the slab thickness shall be concrete encased under the slab.
- m. Conduits that cross structural joints where structural movement is allowed shall be fitted with concretetight and watertight expansion/deflection couplings, suitable for use with metallic

conduits and rigid Schedule 40 PVC conduits. The couplings shall be Appleton Type DF, Crouse-Hinds Type XD, or O-Z Type DX.

- n. Conduit shall be clear of structural openings and indicated future openings.
- o. Conduits through roofs or metal walls shall be flashed and sealed watertight.
- p. Conduit installed through any openings cut into non-fire rated concrete or masonry structure elements shall be neatly grouted. Conduit penetrations of fire rated structure elements shall be sealed in a manner that maintains the fire rating.
- q. Conduits shall be capped during construction to prevent entrance of dirt, trash, and water.
- r. Exposed conduit stubs for future use shall be terminated with galvanized pipe caps.
- s. Concealed conduit for future use shall be terminated in equipment or fitted with couplings plugged flush with structural surfaces.
- t. Horizontal conduit shall be installed to allow at least 7 feet of headroom, except along structures, piping, and equipment or in other areas where headroom cannot be maintained.
- u. Conduit shall not be routed across the surface of a floor, roof, or walkway unless approved by Engineer.
- v. PVC-coated rigid steel conduit shall be threaded and installed as recommended by the conduit manufacturer's installation procedure using appropriate tools.
- w. All conduits that enter enclosures shall be terminated with acceptable fittings that will not affect the NEMA rating of the enclosure.
- x. Conduit which turns out of concrete slabs or walls, shall be connected to a 90 degree elbow of PVC-coated rigid steel conduit before it emerges. Conduits shall have PVC-coated rigid steel coupling embedded a minimum of 3 inches when emerging from slabs or walls and the coupling shall extend 2 inches from the wall.

3-7.02. Underground Conduit Installation. All excavation and concrete work shall conform to the respective sections of these Specifications. Underground conduit shall conform to the following requirements:

- a. Underground conduits indicated not to be concrete encased shall be rigid Schedule 40 PVC.
- b. Underground conduit bend radius shall be at least 2 feet at vertical risers and at least 3 feet elsewhere.
- c. Underground conduits shall have at least 2 feet of earth cover, except where indicated otherwise.
- d. Underground nonmetallic conduits, which turn out of concrete or earth in outdoor locations, shall be connected to 90 degree elbows of PVC-coated rigid steel conduit before they emerge.
- e. Conduits not encased in concrete and passing through walls, which have one side in contact with earth, shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies or with sleeves and modular rubber sealing elements.
- f. Underground conduits shall be sloped to drain from buildings to manholes.
- g. Intercommunication and instrument cables shall be separated the maximum possible distance from all power wiring in pull-boxes, manholes, and handholes.

3-7.03. Sealing of Conduits. After cable has been installed and connected, conduit ends shall be sealed by forcing nonhardening sealing compound into the conduits to a depth at least equal to the conduit diameter. This method shall be used for sealing all conduits at handholes, manholes, and building entrance junction boxes, and for 1 inch and larger conduit connections to equipment.

Conduits entering chlorine feed and storage rooms shall be sealed in a junction box or conduit body adjacent to the point of entrance.

3-7.04. Reuse of Existing Conduits. Existing conduits may be reused subject to the concurrence of Engineer and compliance with the following requirements:

- a. A wire brush shall be pulled through the conduit to remove any loose debris.
- b. A mandrel shall be pulled through the conduit to remove sharp edges and burrs.

3-7.05. Cable Tray Installation. Not Used.

3-8. WIRING DEVICES, BOXES, AND FITTINGS INSTALLATION. Metallic and nonmetallic conduit boxes and fittings shall be installed in the following locations:

3-8.01. Conduit Boxes and Fittings.

- a. Galvanized, threaded, malleable iron boxes and fittings shall be installed in concrete walls, ceilings, and floors; in the outdoor faces of masonry walls; and in all locations where weatherproof device covers are required. These boxes and fittings shall also be installed in exposed rigid steel and intermediate metal conduit systems.
- b. Galvanized sheet steel boxes shall be installed in the indoor faces of masonry walls, in interior partition walls, and in joist supported ceilings.
- c. Rigid PVC device boxes shall be installed in exposed nonmetallic conduit systems.
- d. PVC coated boxes and fittings shall be installed in PVC coated conduit systems.

3-8.02. Device Plates. Oversized plates shall be installed where standard-sized plates do not fully cover the wall opening.

3-8.03. Wall Switches.

- a. Wall switches shall be mounted 3'-6" above floor or grade, unless noted otherwise.
- b. After circuits are energized, all wall switches shall be tested for proper operation.

3-8.04. Receptacles.

- a. Convenience outlets shall be 18 inches above the floor unless otherwise required.
- b. Convenience outlets outdoors and in garages; in basements, shops, storerooms, and rooms where equipment may be hosed down; shall be 4 feet above floor or grade.
- c. After circuits are energized, each receptacle shall be tested for correct polarity and each GFCI receptacle shall be tested for proper operation.
- d. Conduit and wire for convenience outlet installation is not shown on the Drawings and shall be sized, furnished, and installed by Contractor. Conductors shall be minimum 12 AWG and conduit shall be minimum 3/4 inch for convenience outlet installation.

3-8.05. Special Outlets.

- a. Wall thermostats shall be 4'-6" above the floor unless otherwise required. Thermostats on exterior walls shall be suitably insulated from wall temperature.
- b. Data outlets shall be 18 inches above the floor unless otherwise required.

3-9. EQUIPMENT INSTALLATION. Except as otherwise specified or indicated on the Drawings, the following procedures shall be used in performing electrical work.

3-9.01. Setting of Equipment. All equipment, boxes, and gutters shall be installed level and plumb. Boxes, equipment enclosures, metal raceways, and similar items mounted on water- or earth-bearing walls shall be separated from the wall by at least 1/4 inch thick corrosion-resistant spacers. Where boxes, enclosures, and raceways are installed at locations where walls are not suitable or available for mounting, concrete equipment pads, framing material, and associated hardware shall be provided.

3-9.02. Sealing of Equipment. All outdoor substation, switchgear, motor control center, and similar equipment shall be permanently sealed at the base, and all openings into equipment shall be screened or sealed with concrete grout to keep out rodents and insects the size of wasps and mud daubers. Small cracks and openings shall be sealed from inside with silicone sealant, Dow-Corning "795" or General Electric "SCS1200".

3-10. GROUNDING.

3-10.01. General. The electrical system and equipment shall be grounded in compliance with the National Electrical Code and the following requirements:

- a. All ground conductors shall be at least 12 AWG soft drawn copper cable or base, bare or green-insulated in accordance with the National Electric Code.
- b. Ground cable splices and joints, ground rod connections, and equipment bonding connections shall meet the requirements of IEEE 837, and shall be exothermic weld connections or irreversible high-connections, Cadweld "Exothermic" or Burndy "Hyground". Mechanical connectors will not be made with high-compression two-hole lugs.

- c. Ground cable through exterior building walls shall enter within 3 feet below finished grade and shall be provided with a water stop. Unless otherwise indicated, installation of the water stop shall include filling the space between the strands with solder and soldering a 12-inch copper disc over the cable.
- d. Ground cable near the base of a structure shall be installed in earth and as far from the structure as the excavation permits, but not closer than 24 inches. The tops of the ground rods and ground cable interconnecting ground rods shall be buried a minimum of 30 inches below grade, or below the frost line, whichever is deeper.
- e. All powered equipment, including lighting fixtures and receptacles, shall be grounded by a copper ground connector in addition to the conduit connection.
- f. Ground connections to equipment and ground buses shall be made with copper for high conductivity copper alloy ground lugs or clamps. Connections to enclosures not provided with ground buses or ground terminals shall be made with irreversible high-compression type lugs inserted under permanent assembly bolts or under new bolts drilled and inserted through enclosures, other than explosion proof enclosures, or by grounding locknuts or bushings. Ground cable connections to anchor bolts; against gaskets, paint, or varnish; or on bolts holding removable access covers will not be acceptable.
- g. The grounding system shall be bonded to the station piping by connecting to the first flange inside the building, on either a suction or discharge pipe, with a copper bar or strap. The flange shall be drilled and tapped to provide a bolted connection.
- h. Ground conductors shall be routed as directly as possible, avoiding unnecessary bends. Ground conductor installations for equipment ground connections to the grounding system shall have turns with a minimum bend radii of 12 inches.

3-10.02. Grounding System Resistance. The ground system resistance shall comply with National Electrical Code. The grounding system design depicted on the Contract Drawings is the minimum design required for each building or structure. Each system shall comply with the maximum resistance of 5 ohms to ground. Contractor shall confirm the system grounding resistance with the results of the testing specified herein. Systems exceeding the maximum resistance specified shall be supplemented with additional grounding provisions and retested until the maximum specified resistance is achieved.

3-10.03. Grounding System Testing. The grounding system of each existing building or structure indicated below, shall be tested to determine the resistance to earth. Testing shall be performed by an independent electrical or grounding system testing organization. Testing shall be completed after not less than three full days without precipitation and without any other moistening or chemical treatment of the soil.

3-10.03.01. New Grounding Systems. Not used.

3.10.03.02. Existing Grounding Systems. Grounding systems of each existing building or structure indicated shall be tested for resistance to earth.

Existing building(s) or
structure(s) to be tested

Where existing grounding systems can be isolated from the building power service or utility power service a three-point fall of potential test shall be completed as indicated above. Where isolation of the building grounding system is not practical, a clamp-on resistance test will be an acceptable alternative. Clamp-on resistance testing shall be completed utilizing a ground resistance tester specifically designed for clamp on resistance testing, such as the AEMC "Model 3711". Clamp-on resistance measurements shall be taken at the service side of the service entrance neutral, upstream of the neutral to ground bonding connection to ensure a single path between the grounding system and the utility reference.

3.10.03.03. Grounding System Test Report. A report certified by the testing organization shall be prepared and submitted in accordance with the Submittal Procedures section. The final report shall include complete testing results for each building or structure, graphical representation of the test point results for the three-point fall of potential method, and complete observations of all site weather conditions and other environmental conditions that may affect the test results. Final acceptance of the results reported shall be subject to the review and approval of Engineer.

3-11. LIGHTING FIXTURE INSTALLATION. The Drawings indicate the general locations and arrangements of the lighting fixtures. Fixtures in rows shall be aligned both vertically and horizontally unless otherwise specified. Fixtures shall be clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.

Conduit and wire for lighting fixture installation is not shown on the Drawings and shall be sized, furnished and installed by Contractor. Circuits to emergency lighting units, exit signs, and fixtures indicated to be night lights shall not be switched. Circuits to lighting fixtures indicated to have emergency battery packs

shall include an additional un-switched hot conductor. Conductors shall be minimum 12 AWG and conduit shall be minimum 3/4 inch for lighting fixture installation.

3-12. POWER FACTOR CORRECTION CAPACITOR INSTALLATION. Not used.

3-13. HEAT-TRACED PIPING INSTALLATION. Not used.

3-14. MODIFICATIONS TO EXISTING EQUIPMENT. Modifications to existing equipment shall be completed as specified herein and indicated on the Drawings. All existing facilities shall be kept in service during construction. Temporary power or relocation of existing power and control wiring, equipment, and devices shall be provided as required during construction. Coordination and timing of outages shall be as specified in other sections of these Specifications. Electrical power interruptions will only be allowed where agreed upon in advance with Owner, and scheduling at times of low demand may be required.

3-14.01. Demolition. Unless otherwise specified or indicated on the Drawings, all cable and all exposed conduit for power and control signals of equipment indicated to be removed shall be demolished. Conduit supports and electrical equipment mounting hardware shall be removed, and holes or damage remaining shall be grouted or sealed flush. Conduit partially concealed shall be removed where exposed and plugged with expanding grout flush with the floor or wall. Repairs shall be refinished to match the existing surrounding surfaces. Demolished equipment shall be discarded or salvaged as indicated on the Drawings and as specified in other sections of these Specifications.

End of Section

STANDARD SPECIFICATIONS

REFERENCE: UL 83, ICEA S-95-658 (NEMA WC70).
 CONDUCTOR: Solid, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.
 INSULATION: Polyvinyl chloride, UL 83, Type THHN and THWN, ICEA S-95-658.
 SHIELD: None.
 JACKET: Conductor: Nylon, 4 mils (100 µm) minimum thickness, UL 83.
 FACTORY TESTS: Cable shall meet the requirements of UL 83 for Type THHN and THWN.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	µm	in.	mm
12	4.0	1	0.015	380	0.17	4.32
10	6.0	1	0.020	510	0.20	5.08

*The average thickness shall be not less than that indicated above. The minimum thickness shall not be less than 90 percent of the values indicated above.
 A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, THWN or THHN, conductor size, and 600 volt.

600 Volt, Single Conductor Lighting Cable (600-1-PVC-THHN-THWN)

BLACK & VEATCH

Cable Data

Figure 1-16050

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).
 CONDUCTOR: Concentric-lay, uncoated copper; strand Class B. Wet/dry maximum operating temperature 90°C.
 INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.
 SHIELD: None.
 JACKET: None.
 FACTORY TESTS: Cable shall meet the requirements of ICEA S-95-658.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	µm	in.	mm
14	2.5	7	0.030	760	0.17	4.32
12	4.0	7	0.030	760	0.19	4.83
10	6.0	7	0.030	760	0.21	5.33
8	10.0	7	0.045	1140	0.27	6.86
6	16.0	7	0.045	1140	0.31	7.87
4	25.0	7	0.045	1140	0.36	9.14
2	35.0	7	0.045	1140	0.42	10.67
1	40.0	19	0.055	1400	0.48	12.19
1/0	50.0	19	0.055	1400	0.52	13.21
2/0	70.0	19	0.055	1400	0.57	14.48
4/0	95.0	19	0.055	1400	0.68	17.27
250	120.0	37	0.065	1650	0.75	19.05
350	185.0	37	0.065	1650	0.85	21.59
500	300.0	37	0.065	1650	0.98	24.89
750	400.0	61	0.080	2030	1.22	31.00
1,000	500.0	61	0.080	2030	1.37	34.80

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, XHHW-2, conductor size, and voltage class.

600 Volt, Single Conductor Lighting/Power Cable (600-1-XLP-NONE-XHHW-2)

BLACK & VEATCH

Cable Data

Figure 2-16050

STANDARD SPECIFICATIONS

REFERENCE: UL 66, UL 1277.

CONDUCTOR: 16 AWG (1.5 mm²), 7-strand, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 66, Type TFN.

LAY: Twisted pair with 1-1/2 inch to 3 inch (38.10 mm - 63.5 mm) lay.

SHIELD: Cable assembly, combination aluminum-polyester tape and 7-strand, 20 AWG (0.5 mm²) minimum size, tinned copper drain wire, shield applied to achieve 100 percent cover over insulated conductors.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 66.
Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

CONDUCTOR IDENTIFICATION: One conductor black, one conductor white.

FACTORY TESTS: Insulated conductors shall meet the requirements of UL 66 for Type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical-tray flame test requirements of UL 1277.

Cable Details

	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
Single Pair	0.045	1140	0.34	8.64

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the value indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC, Type TFN, conductor size, single pair, and voltage class.

600 Volt, Single Pair, Shielded Instrument Cable (600-SINGLE-PAIR-SH-INSTR)

BLACK & VEATCH

Cable Data

Figure 4-16050

STANDARD SPECIFICATIONS

REFERENCE: UL 83, UL 1277, ICEA S-73-532, ICEA S-58-679.

CONDUCTOR: 14 AWG (2.5 mm²), 7 or 19 strands, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 83, Type THHN and THWN.

SHIELD: None.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 83.
Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

CONDUCTOR IDENTIFICATION: ICEA S-58-679, Method 1, Table 2 or ICEA S-58-679, Method 3, Table 2. White or green conductors shall not be provided.

FACTORY TESTS: Insulated conductors shall meet the requirements of UL 83 for Type THHN-THWN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the flame test requirements of UL 1277 for Type TC power and control tray cable.

Cable Details

Number of Conductors	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
2	0.045	1140	0.38	9.65
3	0.045	1140	0.39	9.91
4	0.045	1140	0.44	11.18
5	0.045	1140	0.46	11.68
7	0.045	1140	0.49	12.45
9	0.045	1140	0.61	15.49
12	0.060	1520	0.66	16.76
19	0.060	1520	0.77	19.56
24	0.060	1520	0.93	23.62
30	0.080	2030	0.98	24.89
37	0.080	2030	1.05	26.67

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC, Type THWN or THHN, conductor size, number of conductors, and voltage class.

600 Volt, Multiconductor 14 AWG (2.5 mm²) Control Cable (600-MULTI-THHN-THWN)

BLACK & VEATCH

Cable Data

Figure 7-16050

Section 16100

ELECTRICAL EQUIPMENT INSTALLATION

PART 1 - GENERAL

1-1. SCOPE. This section covers the installation of electrical equipment.

1-2. GENERAL. Equipment specified to be installed under this section shall be erected, and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

The electrical equipment identified as being provided by others will be furnished complete for installation by Contractor. Technical specifications under which the equipment will be purchased are available.

1-2.01. Coordination. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer. Contractor shall give Engineer written notice at least 14 days prior to the need for manufacturer's field services furnished by others.

Submittals for equipment furnished under the original procurement contract will be furnished to Contractor upon completion of review by Engineer. Contractor shall review equipment submittals and coordinate with the requirements of the Work and the Contract Documents. Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, and field construction criteria.

1-3. DELIVERY, STORAGE, AND HANDLING.

1-3.01. Delivery. When sills are required for electrical equipment, they shall be shipped ahead of the scheduled equipment delivery to permit installation before concrete is placed.

1-3.02. Storage. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with Product Storage and Handling Requirements section, and in accordance with manufacturer's written instructions, until installed in the Work. Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on earth or grass surfaces or come into contact with earth or grass. Contractor shall keep the equipment clean and dry at all times. Openings shall be plugged or capped (or otherwise sealed by packaging) during temporary storage.

16100 – Electrical Equipment Installation

1-3.03. Handling. Electrical equipment shall be moved by lifting, jacking, or skidding on rollers as described in the manufacturer's instructions. Special lifting harness or apparatus shall be used when required. Lifting and jacking points shall be used when identified on the equipment. Contractor shall have required unloading equipment on site to perform unloading work on the date of equipment delivery.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3-1. INSTALLATION, TESTING, AND COMMISSIONING. All installation work shall be in accordance with manufacturer's written instructions.

All material, equipment, and components specified to be installed according to this section shall be installed, tested, and commissioned for operation in compliance with NECA 1000 – NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

Electrical equipment cubicles and vertical sections shall be installed plumb and level. Drawout equipment carriages, circuit breakers, and other removable components shall operate free and easy without binding or distortion.

Unless otherwise indicated or specified, all indoor floor-mounted electrical equipment and control cabinets shall be installed on concrete equipment pads four inches in height.

Indoor metalclad switchgear shall be bolted to steel floor channels which are installed level and flush with the top of the concrete floor or equipment pad.

Outdoor metalclad switchgear and interrupter gear with integral floor channels or beams shall be secured to concrete pads with anchor bolts and clips.

Motor control centers with integral floor sills shall be secured to concrete floors or equipment pads with anchor bolts.

Adequate bracing shall be provided for seismic forces. The bracing shall be designed to meet the requirements of the Meteorological and Seismic Design Criteria section.

3-1.01. Cleaning. All deposits of oil, grease, mud, dirt or debris shall be cleaned from the electrical equipment following installation and field wiring. A detergent water based solution, or other liquid cleaners not harmful to material or equipment finishes, shall be used as recommended by the manufacturer.

End of Section