

**City of Kansas City, Missouri Water Services Department Wes Minder, P.E., Director** 

Executed Contract File
□ Contractor
□ Finance
City Clerk
□ Surety
□ Granting Agency
Project Manager
□ CM/Inspector
Design Professional

# **Project Manual**

## **PROJECT/CONTRACT NO. 81000928/1662**

## BIRMINGHAM PUMP STATION SCREEN REPLACEMENT

## **BIDDER/ADDRESS**

Company		 	
Contact			
Address			
Phone			
Fax			
Email			

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



### ADDENDUM NUMBER <u>1</u>

Project Number 81000928

Project Title Birmingham Pump Station Screen Replacement

#### ISSUE DATE: June 17th, 2022

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on <u>July 12<sup>th</sup> 2022</u>, are amended as follows:

The **mandatory** Pre-Bid Conference date for this Project stated in Document 00130 - Invitation to Bid shall be changed to: 2:00 PM, on <u>Wednesday, June 22<sup>nd</sup> 2022</u>.

#### **Specifications**

- Section 00130. Last Full Paragraph. Delete and Replace with the following: "Bidders are requested to attend the **mandatory** Pre-Bid Conference at 11:00AM, Wednesday June 22nd, 2022, on teams. Please contact the Project Manager prior to the Pre-Bid Conference for a link to the meeting.
- Section 00210. Paragraph 24. Delete and Replace with the following: "<u>Pre-Bid</u> <u>Conference</u> the Water Services Department will hold a pre-Bid conference on Wednesday June 22<sup>nd</sup>, 2022, at 11:00 AM on Microsoft Teams. Contact the Project Manager prior to the meeting for the link to attend. Attendance at the pre-Bid conference is **mandatory** for all Bidders on this Project. For this Project, the City shall not contract with a Bidder who has not attended the entire pre-Bid conference for this Project."

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

## ADDENDUM NUMBER 2



CITY OF FOUNTAINS

Project Number 81000928

Project Title Birmingham Pump Station Screen Replacement

#### ISSUE DATE: June 24, ;2022

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on <u>July 12<sup>th</sup> 2022</u>, are amended as follows:

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

- 1. Pre-Bid Meeting Attendance List is attached.
- 2. Bidder questions to date and responses are included below:

Q1.	Spec indicates bar rack must extend to the top of the channel, which is 34' tall. What is the maximum water level expected? Our bar rack is typically 1' above max water level. There is no hydraulic profile that I can see.
A1.	Max water level is 2' above the operating floor level of EL 733.96. The design basis includes providing screening for the full depth of the channel up to the operating floor level of EL 733.96.
Q2.	For a 3/4" bar spacing, we provide 1/4" x 1" rectangular bars instead of teardrop shaped bars as specified. Teardrop bars are for smaller openings, like 1/4". Will this be acceptable?
A2.	Rectangular bars are acceptable for pre-approved alternate manufacturer(s).
Q3.	Drawing shows a cover for the screen above elevation 733.96. Please confirm there is no floor level lower than this that needs a screen cover.
A3.	The cover for the screen shall be provided as shown on the drawings. The lower level is not designed to have a screen cover.
Q4.	Is there any additional information available for the diversion portion of the project?
A4.	There are a number of ways that diversion can be accomplished in this project. We are leaving the means and method of diversion up to the Contractor to submit to the Engineer for approval during construction.
Q5.	Does the 6hrs shutdown begin when the influent structure is empty?
A5.	No. The 6-hour shutdown window begins when normal flow is interrupted.
O6.	How long will it take to drain the Influent Structure?
A6.	The contractor will need to calculate how long it will take to drain the Influent Structure based on your method for pumping. There is typically 8-feet of water depth in the influent structure, unless there has been a rain event. Refer to work restrictions Section 01140 when planning shutdowns.
Q7.	Is the owner going to assist in pumping/cleaning the influent structure?
A7.	No. It is the responsibility of the contractor to drain and clean the influent structure per Section 01140 Paragraph 1.04.F

Q8.	Can 2 shutdowns happen sequentially, or does the contractor have to wait 24hrs after the
	$2^{nd}$ shutdown begins on the $3^{rd}$ at 8:00 am.
A8.	Refer to work restrictions Section 01140 when planning shutdowns. There is no wait period
	City is notified and the shutdown plan is approved in accordance with Section 01140.
Q9.	It appears that there will be a minimum of 2 shutdowns required (probably 4). Can all of the flow be diverted into the Bypass Channel #2?
A9.	It is the Contractor's responsibility to plan your work schedule and determine the number of shutdowns required. All channels are available for bypass depending on the plan. All channels will require dewatering and debris removal.
010	The scale on multiple pages seems to be incorrect. Is it $2/16'' - 12$
<u><u> </u></u>	The scale is correct at $3/16^{\circ} = 1^{\circ}-0^{\circ}$ . See drawing modification below to change the 6' in the
AIU.	scale bar to 8'.
Q11.	Currently, the project specifications contain specification section 01565 - Asbestos Abatement.
	Please clarify to the prospective Bidders if there are any existing reports identifying hazardous
Δ11	There are no existing reports identifying hazardous materials or asbestos containing materials at
AII.	the project site.
Q12.	Please clarify to the prospective Bidders if there are any Buy American Requirements or
	American Iron & Steel (AIS) Provisions that the Bidders will be required to comply with and/or
A12	Please see 00210 – Paragraph 13 – City's Buy American and Missouri Preferences Policies.
A12.	Please review all sections of the specification for requirements.
Q13.	Can you confirm the elevation for 'Top of Channel'?
A13.	I op of Channel is at the operating floor level of EL 733.96.
014	Section D on Shoot B 007 indicates that the channel walls for each screen extend up to the
Q14.	Operating Floor (FL 734.00). This means that all the flow in the channel must go thru the
	screen, which creates the opportunity for increased headlosses (up to 34 ft).
A14.	Correct, the channel walls will extend up to the operating floor (EL 733.96). Correct, the flow in
	the channel must go through the screen.
015	Section B on Sheet P-006 suggests that there is an intermediate Operating Floor at FL 724.00
Q13.	which means that the area above FL 724.00 is a large open area. In this case, the channel walls
	actually go up to EL 724.00, not EL 734.00.
A15.	Section B on Sheet P-006 is a cross section in the middle of the channels. One goal of the
	project is to increase "channelization" of the flow at the screen locations. Per the structural improvement on S103, walls will be constructed during this project to close any openings.
	between the mezzanine level and the operating floor level around the screens. The channel
	walls will go up to EL 733.96 after the project is complete. Water levels currently overflow the

Q16.	In addition to confirming the 'Top of Channel' elevation, which will dictate our bar rack height, please confirm the maximum differential that the bar rack must accommodate. If it is 34 ft, we will design the bars and frame for 34 ft. If it is 24 ft, we'll design for 24 ft. We are needing to know what headloss is possible for this configuration and possible flow conditions. We can provide frame supports (anchored to the channel walls) to support the screen under these flood conditions without significantly increasing the size of the frame.
A16.	Headloss calculations must be performed by the manufacturer for your specific equipment friction losses. Per Section 11330, Paragraph 2.02.A.4, headloss at average flow shall be less than 1.00 ft and headlosses at peak flow shall be less than 1.00 ft, assuming 25% blinding. Section 113300, Paragraph 2.02.A.2 provides the average and maximum flow per screen. The maximum differential head across the screen is determined when the upstream elevation is higher than the downstream flow, and anticipates headloss through the equipment. The maximum differential head across the screen is 6-foot as stated in Section 11330 Paragraph 2.02.A.2. The high water expected is 2-feet above the operating floor level (EL 733.96). There is no flow monitoring at the Pump Station. Peak flows at the Pump Station are indicated to currently be greater than 20 MGD. The hydraulic capacity of the Pump Station is designed to match the hydraulic capacity of the downstream WWTP of 32.5 MGD. The design anticipates for the Pump Station to operate with one screen out of service. As stated in Section 11330 Paragraph 2.02.A.2, the design is for a single screen to handle the total flow of 32.5 MGD.
Q17.	Also please clarify how often these flood conditions occur. I'm assuming very infrequently?
A17.	Overflow conditions have been happening a number of times a year, but have lessened in the past couple years to several times a year. Overflow frequency is estimated by operations staff.

#### Specifications

- 1. Section 11340. Paragraph 1.04.B.2. Delete and Replace with the following: "Detailed installation drawings illustrating how the proposed conveyor fits in the space provide and aligns with the screens and dumpster to be provided by the Contractor. The drawings shall include plan, elevation, and sectional views of the installation. Drawings shall include details of the conveyor mechanisms, conveyor belt, and structural components."
- 2. Section 11340. Paragraph 1.04.B.3. Delete and Replace with the following: "Solids loading calculations and structural analysis for the proposed conveyor verifying that the conveyor is capable of processing the peak flow."
- 3. Section 11340. Paragraph 1.05.B. Delete and Replace with the following: "The equipment manufacturer warranty shall cover all necessary equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer. The Contractor's warranty shall cover all necessary labor resulting from any equipment manufacturer warranty issues."

#### Drawings:

- 1. Drawing Pages 2, 3, 4, 6, 7, & 8. On the scale bar, Delete the "6' " and Replace with "8' ".
- 2. Drawing IC-102. Delete and Replace with attached revised IC-102.

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

#### KCMO Pre-Bid Meeting Attendance List

#### Birmingham Pump Station Screen Replacement Thursday, June 23, 2022

Company	First Name	Last Name	E-Mail
KCMO - Water	David	Elge	david.elge@kcmo.org
Lion CSG	Nicole	Young	nicole.young@LionCSG.com
Taliaferro & Browne	Taylor	Rich	trich@tb-engr.com
Premier Engineering	Ken	Diehl	kdiehl@preengcon.com
Premier Engineering	Ted	Wilson	twilson@preengcon.com
Alexander Mechanical	Jeff	Marshall	Jmarshall@AlexanderMechanical.com
Crossland Heavy Contractors	Charlie	Rarick	crarick@heavycontractors.com
Duperon Corporation	Tammy	Blanchard	tblanchard@duperon.com
Duperon Corporation	Jack	Greiner	Jgreiner@Duperon.com
Duperon Corporation	Bob	Lipscomb	Rlipscomb@Duperon.com
Duperon Corporation	Mark	Wilson	Mwilson@Duperon.com
Environmental Process	Joe	Foster	Jfoster@EPECwater.com
Garney	David	Farkas	dfarkas@garney.com
Garney	Joey	Perell	jperell@garney.com
Genesis Environmental Solutions	Chris	Coffman	Ccoffman@GenesisEnviro.com
Goodwin Brothers	David	Hoover	dhoover@goodwinbros.com
Goodwin Brothers	Jack	Hruska	jhruska@goodwinbros.com
Goodwin Brothers	Adam	Redecker	aredecker@goodwinbros.com
Haynes Equipment	Shawna	Sorenson	ssorenson@haynesequip.com
JCI Industries	Kathi	Graham	kgraham@jciind.com
KCMO - Water	Blake	Anderson	blake.w.anderson@kcmo.org
KCMO - Water	Tanya	Lewis	Tanya.lewis@kcmo.org
KCMO - Water	Jarrek	Lucke	jarrek.lucke@kcmo.org
KCMO - Water	Leona	Walton	Leona.Walton@kcmo.org
KCMO General Services	Derrick	Smith	derrick.smith@kcmo.org
Letts, Van Kirk & Associates	Rick	Van Kirk	Rick@LettsVanKirk.com
MegaKC Corporation	Brad	Boyles	megabids@megakc.com
Radmacher Brothers Excavating	Nathan	Riley	nriley@radbroex.com
RE Pedrotti	Dallas	Massie	dallasm@repedrotti.com
SHEDIGSIT	Dennis	Johnson	dennis@shedigsit.com



#### BIRMINGHAM BAR SCREEN OPERATING SCENARIO

THE MECHANICALLY CLEANED BAR SCREEN WILL EITHER BE STARTED AND STOPPED BY THE PLC IN THE MAIN CONTROL PANEL OR WILL BE STARTED AND STOPPED REMOTELY BY THE PUMP STATION'S SCADA SYSTEM VIA THE SCREEN PLC. THE PUMP STATION'S SCADA SYSTEM WILL CONTROL THE SCREENS EITHER BY TIME OR BY INFLUENT LEVEL. LEVEL TRANSMITTER IN THE INFLUENT STRUCTURE IS SPECIFIED AND FURNISHED UNDER DIVISION 13, AND WILL PROVIDE LEVEL MEASUREMENT OF THE INFLUENT STRUCTURE UPSTREAM OF THE BAR SCREEN TO THE PLC. HIGH LEVEL WILL OVERRIDE THE INTERNAL SOFTWARE TIMER TO OPERATE THE SCREEN UNTIL THE LEVEL HAS DROPPED TO A SPECIFIED MINIMUM VALUE.

TWO LEVEL/TWO SPEED CONTROL: WHEN THE LOWER LEVEL SWITCH TRIPS, THE RAKE RUNS AT NORMAL SPEED. WHEN THE UPPER LEVEL SWITCH TRIPS, THE RAKE RUNS AT HIGH SPEED. WHEN THE UPPER LEVEL SWITCH REACHES TO NORMAL POSITION THE BAR SCREEN RUNS AT NORMAL SPEED AND WHEN THE LOWER LEVEL SWITCH REACHES TO NORMAL POSITION THE BAR SCREEN RUNS AT LOW SPEED, AN OFF/ON DELAY TIMER IS TO BE USED TO PREVENT FREQUENT AND UNNECESSARY STARTING AND STOPPING. CYCLE TIMING LOGIC SHALL ALSO BE INCLUDED THAT SHALL FUNCTION IN PARALLEL WITH THE LEVEL CONTROL FOR OPTIMAL RAKE RUN TIME. THE CONVEYOR WILL RUN ANYTIME THE BAR SCREEN RUNS, AND WILL INCREASE IN SPEED AS THE BAR SCREEN

#### LOOP 300-399 - CONVEYOR (VENDOR PROVIDED)

ONE CONVEYOR IS DEDICATED TO THE TWO COARSE SCREENS. SCREENINGS WILL BE TRANSPORTED TO A DUMPSTER AND LIQUID WILL DRAIN BACK TO THE BAR SCREENS

EQUIPMENT: CONVEYOR SYSTEM (CNV-001)

CONTROL: THE CONVEYOR IS CONTROLLED FROM A LOCAL CONTROL STATION (LCS-320). THE CONVEYOR CONTROL SHALL BE DESIGNED TO BE OPERATED AUTOMATICALLY IN THE ALTERNATIVE AUTOMATIC MODES OR IN MANUAL MODE

CONVEYOR COMPONENTS WILL BE OPERATED BASED ON VENDOR PROVIDED LOGIC. THE CONVEYOR CONTROL SHALL BE DESIGNED TO BE OPERATED AUTOMATICALLY IN THE ALTERNATIVE AUTOMATIC MODES OR IN MANUAL MODE DESCRIBED IN SPECIFICATION SECTION 11320 FOR DETAILED CONTROLS/INFORMATION.

MAIN CONTROL PANEL(MCP-320) IS A RELAY BASED PANEL, WITH DRY CONTACT AND TERMINAL BLOCK CONNECTIONS FOR DISCRETE COMMUNICATIONS

ADDENDUM #1 KC WATER SERVICES COMMENTS, ADDED EQUIPMENT 6-15-22

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS HEREON ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE. AND DISCLAIMS (PURSUANT TO SECTION 327.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

SSIONAL ENGINEER SEAL	KANSAS C	TTY, MISSOU	RI, WATER SE	ERVICES D	EPARTN	<b>AENT</b>
E OF MISSO	FAC	ILITY	IMPRO	OVE	MEN	JT
TED R. WILSON THEME	SCI	REEN	REPLA	ACEN	<b>IEN</b>	T
ONAL ENGLISH		BIRMINGH 11011 NE KA	IAM PUMPIN E BIRMINGHA ANSAS CITY,	IG STATIO AM ROAE MO	ON )	
FOR WSD USE:	- BID	DOCUI	MENT S	UBMI	TTA]	[_
	SCRE	EN IN	STRUM	ΛΕΝΊ	TAT	ION
		AND	CONT	ROL		
	DRAWN BY TRW	CHECKED BY	DATE SUBMITTE	D RANGE XX	twp XX	sec XX
		CONTRACTOR		DAT	E COMPLE	TED
	contract no. 1662	CONTRACT DATE	MAP NO. XXXX	WORK ORDER N	NO. DRAV	ving no. C <b>-102</b>
	PROJECT NO. 81000928			SH	IEET 53	OF 60





CITY OF FOUNTAINS

Project Number 81000928

Project Title Birmingham Pump Station Screen Replacement

#### ISSUE DATE: June 30, 2022

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on <u>July 12<sup>th</sup> 2022</u>, are amended as follows:

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

- 1. As-Built drawings are provided as an attachment.
- 2. Wastewater Chemical Feed System is added with Specification 13855 and modifications to Drawings P-008, S-101, S-105, and M-104. This system is being added as an alternate, as such, the following specification sections are modified below: 00210, 00410, and 00420. A yard hydrant and emergency eyewash & shower station are also provided. This system is in addition to the mechanical Odor Control System specified in 11350. The mechanical Odor Control System specified in 11350 treats the air in the pump station and is protective of corrosion within the pump station and air quality for personnel at the pump station. However, the mechanical Odor Control System in 11350 does not provide treatment to the hydrogen sulfide in the water, causing concern at the downstream protection at the wastewater treatment plant (WWTP). A secondary system in 13855 for a Wastewater Chemical Feed System is being provided to treat the hydrogen sulfide in the liquid phase to be protective of the WWTP. This chemical treatment with the 13855 Chemical Feed System does not have time for the reaction to occur to be protective of the pump station. Therefore, both systems are required to be protective of both the pump station and the WWTP.
- 3. Bidder questions to date and responses are included below:

Q1.	Sheet S101 shows dimensions for equipment pads #3 & #4 that are different from the dimensions for the same equipment pads on sheet M-100. What are the correct dimensions for equipment pads #3 and #4?
A1.	Follow Mechanical Plans for correct dimensions. S101 is updated to reflect mechanical plans in the drawing changes below.
Q2.	Sheet S102 / Section 2 shows (2) dowel location to anchor into existing. Sheet S102 / Section 4 show (1) dowel location. Which detail is correct?
A2.	Detail 4/S102 is correct showing 1 dowel. Sheet S102 / Section 2 is updated in the drawing changes below.
Q3.	The new asphalt pavement on sheet P-008 is called out to match existing asphalt thickness.
_	How thick is the existing asphalt pavement on sheet P-008
A3.	Existing pavement cross section includes 2" asphaltic surface course, 6" asphaltic concrete
	base, and compacted subgrade as shown on Sheet 33 of 50 of the as-built drawings.

Q4.	Spec 3300 2.03.E.Table A: Concrete indicates that class A concrete is 4500#/si @ 28 days. Sheet S100 / Cast In Place Concrete: Note 3 says that concrete is 5000#/si @ 28 days. Which one is correct?
A4.	Follow drawing note 3 which calls out 5000 psi. Specification 3300 2.03.E Table A is modified in the specification changes below.
05.	Will an Overhead door spec be provided for the new Overhead Door to be installed?
A5.	The overhead door specification is inserted in the specification modifications below and is attached.
Q6.	There are two spec sections labeled "Temporary Erosion and Sediment Control" 01570 and 02270. Is this correct?
A6.	The Specification 02270 is deleted in its entirety in the specification modifications below.
Q7.	In Spec 01140 Work Restrictions: 1.04.B.7 says "Notify the City at least 2 weeks in advance of any tasks that will require dewatering and cleaning to allow the City the appropriate amount of time to conduct the work. 1.04.F.1 says "the Contractor is responsible for costs and procedures required to dewater and dispose of liquid, solids, etc. Please clarify the role the city will play in dewatering and cleaning the work areas.
A7.	Paragraph 1.04.B.7 is modified in the specification modifications below to state that the notice is to allow City appropriate time to modify operations for the Contractor to conduct the work. It is the Contractor's responsibility for costs and procedures required to dewater and dispose of liquids, solids, etc. Paragraph 1.04.F.1 is modified below to clarify dewatering and cleaning of Channels, 1, 2, and 5, which are to be fully cleaned before closing with gates.
Q8.	Sheet S102 / Section 1 calls out a rubber mat to be placed over the grating. What is the thickness required for the rubber mat and can the mat be interlocking pieces or does it need to be one called piece?
A8.	Rubber mats are to be installed in coordination with the mechanical odor control system specified in 11350. Contractor will need to coordinate with the mechanical odor control system to determine requirements for the rubber mat. Note is modified in the drawing changes below.
Q9.	On plan sheet 24 (M-100) General Note #5, Natural Gas Piping above grade shall be threaded pipe up to and including 4-inch. This does not match what Spec. Section 15192 states. Please clarify what sizes can be threaded.
A9.	The General Note #5 on the drawings, M-100 and M-101, is correct and the limitation on threaded natural gas pipe in Specification Section 15192 to sizes 2-inch and under is incorrect. In accordance with the International Fuel Gas Code and our General Note #5 on the drawings, threaded ASTM A53 steel pipe is acceptable in sizes up to and including 4-inch.
Q10.	Specification 03200 identifies stainless steel bar supports to be used on the project in paragraph 2.01 C. Paragraph 3.01 C (Table 2) also calls for stainless steel bar supports. Contractor is requesting confirmation that stainless steel bar supports will be required.
A10.	That is correct, use stainless steel bar supports.

Q11.	Specification 01480 for water tightness indicates that leak testing is required for water- containing structures, but the included schedule does not call out any structures from this pump station. Paragraph 3.01 B identifies concrete structures from the Birmingham WWTP Headworks Facility to be leak tested. Contractor is requesting clarification as to whether any new concrete at the pump station will be required to be leak tested.
AII.	Section 01480 Paragraph 3.01.B is modified in the specification changes below.
Q12.	Sheet S105 calls for the new overhead door to match the size of the existing overhead door on the opposite side of the building; the drawings and specs do not provide any information detailing what type of overhead door will be required. Contractor is requesting that a specification or door schedule be provided to define what will be required.
A12.	The overhead door specification is inserted in the specification modifications below and is attached. Door size to be a 12'x15' roll up door. See Sheet 2 of 50 and Door Schedule on Sheet 16 of 50 in the as-builts. Dimensions are added to the drawings in the changes below.
Q13.	The coating schedule in paragraph 3.05 A of specification 09960 calls for the wastewater channels and wet wells to receive high-performance coatings. It does not appear that the elevation to terminate this coating has been provided. Contractor is requesting confirmation as to what elevation these coatings should be applied.
A13.	The channels and wet wells should receive coating for the full wall depth to elevation 734.00. Specification is modified below.
Q14.	Plan sheet PD-003; EL. 733.00; Keynote #4 states, "Remove Existing CMU Wall." There does not appear to be a section that details the height of the existing Storage CMU wall. Please clarify to the prospective Bidders the height of the existing Storage CMU wall that is to be demolished and removed.
A14.	Elevation of top of existing Storage room is EL 743.83. The room is to be demolished including walls and ceiling. Plan and section included on Sheet 4 of 50 of the as-builts. Modification to the Keynote is included in the drawing changes below.
Q15.	Plan sheet PD-003; EL. 733.00; Keynote #6 states, "Remove Concrete Wall." There does not appear to be any further clarification or details on the required height/opening of the three (3) new openings to be made along the south wall where the Vapex Odor Control Equipment is to be installed. Please clarify to the prospective Bidders the required height/opening of the three (3) new openings to be made along the south wall where the Vapex Odor Control Equipment is to be installed.
A15.	Note added to structural drawings below. New openings to be made along the south wall where the Vapex Odor Control Equipment are to be 3'-0"x7'-0". Field verify existing column locations, existing columns are not to be cut or damaged.
Q16.	Plan sheet SD100; Keynote #5 states, "Height to match rollup door on the other side of the building." Please clarify to the prospective Bidders the height of the rollup door on the other side of the building that is to be matched.
A16.	Existing doors are 12' wide x 15' tall, openings should be 12'-6"x 15'. SD100 Keynote #5 is updated in the drawing modifications below.

Q17.	Plan sheet S102 denotes two (2) new 3'-0" access manholes to be installed behind screens located at channels 3 and 4 and bolted down. There does not appear to be any details nor specification sections provided for these access manholes. Please provide a detail and any applicable specification sections to the program between the program.
A17.	The access manholes are strictly entry points and not intended to have a cone or barrel section. There is only a hole cut for a manhole ring and manhole cover. In the event that, entry is required for access to the back of the screens, a tripod will be needed to lower personnel for entry. Access manholes are to be 3'-0" round bolt down steel flush mounted manhole cover and frame. Use Manholes Covers Direct Large Round Steel Manholes or approved equal. Notes on S-102 are updated below.
Q18.	Plan sheet SD100; North Plan Floor EL. 724.00; Keynote #8 states, "Sawcut and remove existing concrete blocks in channels and patch as necessary (Bid Alternate 2). There does not appear to be any given dimensions of the existing concrete blocks in channels to be removed. Please provide the prospective Bidders with either as-built information or approximate dimensions of the existing concrete blocks in channels to be removed.
A18.	and Sheet 20 of 50.
Q19.	Plan sheet M-101 depicts two (2) new screen room exhaust fans and one (1) new exhaust room exhaust fan to be installed. There does not appear to be any information or details of the existing roof structure. Please clarify and provide further clarification regarding the existing roof structure in which the new exhaust fans are to be installed.
A19.	Roll-type roofing has been used on the insulated roof decks over the Screen Room and the Main Operating Floor. The roll-roofing material appears to be a granule-surfaced, modified bitumen membrane. The photographs below show how the roof curbs for the existing fans were done when installed.
	A - Koot Above Screen Koom B – Root Above Main Operating Floor

Q20.	Regarding Section 11330, Paragraph 2.02.E: #1 - The installation is indoors. Please confirm dead plate heat pads are required. #2 – The installation is indoors. Please confirm Class 1 Div II heat pads are required instead of
1.00	
A20.	The screens in the current installation have had issues with freezing in the winter. While
	modifications to the air handling system should alleviate some freezing issues, the Dead Plate
	Heat Pads are provided for this installation to eliminate freezing issues for operations and
	should be included in the installation. Paragraph 2.02.E is updated to show Class 1 Div 1.
	Paragraph 2 02 E and Paragraph 2 03 B are undated to clarify responsibility for installation is
	Contractor and not by others. Drawings E-102 and E-200 are updated to reflect the bar screens
	and dead plate heat pads.

#### Specifications

- 1. Table of Contents. Modify 01240 Alternatives to "01230 Equipment Alternatives."
- 2. Table of Contents. Delete "02270 Temporary Erosion Control."
- 3. Table of Contents. Insert "03223 Overhead Coiling Door."
- 4. Table of Contents. Insert "13855 Wastewater Chemical Feed System."
- 5. Section 00210. Instructions to Bidders. Paragraph 1.a. Change "hundred twenty (120) days" to "ninety (90) days" in two places.
- Section 00210. Instructions to Bidders. Insert Paragraph 2.c.(5) as follows: "Required Alternate 5: Per drawings P-008, S-101, S-105, M-104 and Specification 13855 new Wastewater Chemical Feed System, yard hydrant, emergency eye wash & shower station, associated plumbing, and associated electrical."
- 7. Section 00410. Bid Form/Contract. Delete and Replace with attached.
- 8. Section 00420. Alternates Bid For. Delete and Replace with attached.
- 9. Section 01140. Paragraph 1.04.B.7. Delete and Replace with the following: "Notify the City at least 2 weeks in advance of any tasks that will require dewatering and cleaning to allow the City the appropriate amount of time to modify City operations as appropriate to accommodate Contractor's work."
- 10. Section 01140. Paragraph 1.04.F.1. Delete and Replace with the following: "When the Owner has turned the process unit over to the Contractor for modification or temporary use, the Contractor is responsible for costs and procedures required to dewater and dispose of liquid, solids, etc. in the process unit. Channel 1, Channel 2, and Channel 5 are to be cleaned of solids and dewatered before being closed off and turned over to owner." Subparagraphs to remain.
- 11. Section 01230. Delete and Replace with attached.
- 12. Section 01480. Paragraph 3.01 B. Delete and replace with the following: "Test the following concrete structures for water leakage:
  - a. Structural channel modifications."
- 13. Section 02270 Temporary Erosion Control. Delete in its entirety.
- 14. Specification 3300 2.03.E.Table A. Modify Class A concrete to show the Minimum Specified Compressive Strength f'c at 28 Days (Pounds per Square Inch) to equal 5,000.
- 15. Section 08332 Overhead Coiling Door. Insert attached in its entirety.

- 16. Section 09960. Paragraph 3.05.A.1. Delete and replace with the following: "Wastewater Channels & Wet Well (all vertical and all horizontal surfaces):" Subparagraphs to remain.
- 17. Section 11330. Paragraph 2.02.E. Delete and Replace with the following: "Bar Screen Dead Plate Heat Pads to be provided. Power requirements for the Dead Plate heaters are 120VAC and provided by Contractor. Installation of the field wiring supplied by Contractor. Pads shall be fiberglass reinforced silicone rubber suitable for use on metal surfaces. Pads shall have a minimum power density of 2.5 W/in2 and a dielectric strength greater than 2000 volts. Pads shall have a high-limit thermostat designed to keep the pad below NEC article 500 T-rating. Pads shall be moisture, chemical and radiation resistant. Class I Division I area head pads and thermostats."
- 18. Section 11330. Paragraph 2.02.B. Delete and Replace with the following: "Each raking assembly shall have a separate level system that shall be installed and field wired by Contractor per the manufacturer's instructions."
- 19. Specification 11330. Paragraph 1.01.C. Delete and Replace with the following: "Each screen shall be furnished complete with bar rack, dead plate, discharge chute, side frames, covers, rake blades, drive chains, sprockets and bearings, scraper assembly, drive motor, gear reducer, anchor bolts, controls and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation. Modifications to channels necessary to install each screen shall be included in manufacturer installation instructions. Details of any required grouting or seal between the screen and the side walls of the channel shall be included in manufacturer installation is responsible for costs and procedures required for channel modifications required for installation of the screens including any grout work necessary to fill gaps in the side channels for screen installation."
- 20. Section 13855 Wastewater Chemical Feed System. Insert attached in its entirety.
- 21. Section 15192. Paragraph 2.1.A.1. Delete and Replace with the following: "NPS ½ to 4, screwed."

#### Drawings:

- 1. Cover Sheet. Drawing Index. At bottom of Drawing Index, insert Header for "Addendum". Under new header, insert Sheet No, Title No: "26A New Outdoor Emergency Eyewash and Shower Installation." New sheet is inserted below as M-104.
- Sheet PD-003; EL. 733.00; Keynote #4. Modify Keynote #4 as follows: "Remove Existing Storage Room including CMU Walls and ceiling. Elevation of top of existing Storage Room is EL 743.83."
- 3. Sheet P-008. Delete and Replace in its entirety. Changes are bubbled to show the new Wastewater Chemical Feed System, flush water, and associated eyewash/shower station.
- 4. Sheet SD100. Keynote #5. Modify Keynote #5 as follows: "Overhead door width to match the door on the opposite side of the building. Door shall be a 12'x15' roll up door."
- 5. Sheet SD100. North Plan Floor EL. 724.00. Keynote #8. Modify Keynote #8 as follows: "Sawcut and remove existing concrete blocks in channels and patch as necessary (Bid Alternate 2). Dimensions of existing concrete blocks in channels are estimated at approximately 5'-6"x12'-8"x2'-0" "

- 6. Sheet SD100. For new openings to be made along the south wall where the new room is created for the Vapex Odor Control Equipment, modify the Keynote from #5 to #11. In Demolition Notes, add Keynote 11 as follows: "Sawcut existing concrete wall. New openings to be made along the south wall where the Vapex Odor Control Equipment are to be 3'-0"x7'-0". Field verify existing column locations, existing columns are not to be cut or damaged."
- 7. Sheet SD100. For stairs at the exterior of the southeast portion of the operating room, modify the Keynote from #8 to #7.
- 8. Sheet S101. Delete and Replace in its entirety. Changes are bubbled to show updates for modifying dimensions for equipment pads #3 & #4 to reflect sheet M-100. Changes are bubbled to show updates for the Wastewater Chemical Feed System structural pads.
- 9. Sheet S102. Section 2. Modify to reflect Sheet S102, Section 4 showing one (1) dowel location.
- 10. Sheet S102. Add the following General Note: "General Note Note 1. Rubber mats are to be selected and installed in coordination with the mechanical odor control system specified in 11350. Contractor shall coordinate with the mechanical odor control system to determine requirements for the rubber mat including thickness and manufacturing requirements."
- 11. Sheet S102. Modify note regarding access manholes as follows: "(2) 3'-0" Ø access manholes to be installed behind screens located at Channels 3 and 4. Access manholes are strictly entry points and not intended to have a cone or barrel section. Access manholes are to be bolt down steel flush mounted manhole cover and frame. Use Manholes Covers Direct Large Round Steel Manholes or approved equal."
- 12. Sheet S105. Delete and Replace in its entirety. Changes are bubbled to show updates for the Wastewater Chemical Feed System structural pads. Changes are bubbled to show updates to modify Section 3 notes on overhead door to show dimensions for a 12'x15' roll up door.
- 13. Sheet E-102. Delete and Replace in its entirety. Changes are bubbled to show updates for bar screens and dead plate heat pads.
- 14. Sheet E-200. Delete and Replace in its entirety. Changes are bubbled to show updates for bar screens and dead plate heat pads.
- 15. Sheet M-104. Insert sheet 26A. Sheet shows the new Wastewater Chemical Feed System, flush water, and associated eyewash/shower station. Sheet shows potable water line to the mechanical Odor Control Systems.

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



**BID FORM/CONTRACT** 

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

- 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. 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 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>100,000.00</u>
TOTAL BID IN NUMERIC FIGURES	\$
TOTAL BID REQUIRED ALTERNATE 1	\$
TOTAL BID REQUIRED ALTERNATE 2	\$
TOTAL BID REQUIRED ALTERNATE 3	\$
TOTAL BID REQUIRED ALTERNATE 4	\$
TOTAL BID REQUIRED ALTERNATE 5	\$

- 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. Form 00413 Allowances contain prices included in the Base Bid, and is incorporated into this Bid. Form must be completed and returned with this Bid.
- 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:



- 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 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.
- 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 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:	12% MBE	12% 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 <u>currently</u> 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
2.	Address
	Telephone No.
	I.R.S. No.
	Area/Scope of work
	Subcontract amount
E.	Name of M/WBE Firm
	Address
	Telephone No.
	I.R.Ś. No.
	Area/Scope of work
	Subcontract amount

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

Bidder:

(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 HRD 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 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.

Bidder:

**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: \_\_\_\_\_

#### 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:

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

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

Required Alternate No. 1: Required Alternate No. 2: Required Alternate No. 3: Required Alternate No. 4: Required Alternate No. 5:

\$			
\$			
\$			
\$			
\$			
			_

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)

#### CITY OF FOUNTAINS Heart of the Nation



## ALTERNATES

Project/Contract Numbers: 81000928/1662

#### Project Title: Birmingham Pump Station Screen Replacement

Page 1 of 1

No:	Description:	□ Add [+]	Price in Figures:
		Deduct [-]	
1	Parkson Aqua Caiman® screens is substituted from the		
	Duperon FlexRake® listed in Section 11330, Paragraph		¢
	2.01. A		<b>Þ</b>

No:	Description:	<ul> <li>Add [+]</li> <li>Deduct [-]</li> </ul>	Price in Figures:
2	Per Sheet SD100, Note 8, Removal of existing concrete		
	blocks in channels and patch as necessary.		\$

No:	Description:	□ Add [+] □ Deduct [-]	Price in Figures:
3	120 day bid escalation		
	Change in cost if the bid is awarded 120 days after the bid opening (Instead of 90 days as listed in 00210 Paragraph 1.a.)		\$

No:	Description:	🖵 Add [+]	Price in Figures:
4	150 day bid escalation	Deduct [-]	
			¢
	Change in cost if the bid is awarded 150 days after the		Φ
	bid opening (Instead of 90 days as listed in 00210		
	Paragraph 1.a.)		

No:	Description:	Add [+]	Price in Figures:
5	Wastewater Chemical Feed System		
	Per drawings P-008, S-101, S-105, M-104 and Specification 13855 new Wastewater Chemical Feed System, yard hydrant, emergency eye wash & shower station, associated plumbing, and associated electrical work.		\$

#### SECTION 01230 – EQUIPMENT ALTERNATES

#### PART 1 GENERAL

#### 1.01 SUMMARY

A. Section includes: Identification and description of Equipment Alternates.

#### 1.02 PROCEDURES

- A. Equipment Alternates will be exercised at Owner's option.
- B. Coordinate related work and modify surrounding work as required to complete the Work, including changes under Alternates accepted by Owner in Notice of Award.

#### 1.03 EQUIPMENT ALTERNATES

- A. Required Alternate No. 1
  - 1. Base Bid: Section 11330 Paragraph 2.01.A Duperon FlexRake® as indicated and specified.
  - 2. Bid Alternate: Parkson Aqua Caiman®
    - a Any alternate system must meet all requirements of specified system.
    - b All redesign costs must be included in the alternate bid price.
    - **c** Any construction modifications must be included in the alternate bid price.
- B. Additional Equipment Alternatives
  - a. Any proposed equal as an alternate equipment system must be approved by engineer to meet all requirements of the specified system. Proposed equals for equipment items must demonstrate a minimum of five (5) equivalent installations in the United States that have operated for more than five (5) years.
  - b. All redesign costs must be included in the alternate bid price.
  - c. Any construction modifications must be included in the alternate bid price.

#### PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

#### SECTION 08332 OVERHEAD COILING DOOR

#### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. Section Includes:
  - 1. Insulated service door.

#### 1.02 ACTION SUBMITTALS

#### A. Product Data:

- 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
- 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- 3. Include description of automatic closing device and testing and resetting instructions.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
  - 1. Include plans, elevations, sections, and mounting details.
  - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
  - 4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
  - 5. Show locations of controls, locking devices, detectors, and other accessories.
  - 6. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
  - 1. Include similar Samples of accessories involving color selection. Color to match existing doors at pump station.

#### 1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

#### 1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling door to include in maintenance manuals.
- 1.05 QUALITY ASSURANCE
  - A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
  - B. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

#### 1.06 WARRANTY

- A. Warranty: Manufacturer's limited door warranty for 5 years on door system materials and workmanship.
- B. Warranty: Manufacturer's limited door system warranty for 2 years for all parts and components.

#### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain overhead coiling door from single source from single manufacturer.
  - 1. Obtain operators and controls from overhead coiling door manufacturer.

#### 2.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Door: Capable of withstanding the design wind loads.
  - 1. Design Wind Load: +/- 25 PSF.
  - 2. Testing: According to ASTM E 330.
  - 3. Deflection Limits: Design overhead coiling door to withstand design wind load without evidencing permanent deformation or disengagement of door components.
  - 4. Operability under Wind Load: Design overhead coiling door to remain operable under design wind load, acting inward and outward.

- B. Windborne-Debris Impact Resistance: Provide overhead coiling door that pass missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone 4.
  - 1. Large-Missile Test: For overhead coiling door located within 30 feet (9.144 m) of grade.
  - 2. Small-Missile Test: For overhead coiling door located more than 30 feet (9.144 m) above grade.

#### 2.03 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. C.H.I. Overhead Doors, Inc.
    - b. Cornell.
    - c. Overhead Door Corporation.
- B. Operation Cycles: Door components and operators capable of operating for not less than 100,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
  - 1. Include tamperproof cycle counter.
- C. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. (5.1 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283 or DASMA 105.
- D. STC Rating: 21 minimum.
- E. Curtain R-Value: 7.7 minimum.
- F. Door Curtain Material: Aluminum.
- G. Door Curtain Slats: Flat profile slats.
- H. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from aluminum extrusions and finished to match door.
- I. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats.
- J. Hood: Match curtain material and finish.
  - 1. Shape: Round or Square
  - 2. Mounting: As shown on Drawings.
- K. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.

- L. Electric Door Operator:
  - 1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
  - 2. Operator Location: Wall.
  - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.44 m) or lower.
  - 4. Motor Exposure: Exterior, wet, and humid. Motor shall be rated for use in NEC Class 1, Division 1, Group D locations.
  - 5. Emergency Manual Operation: Push-up and Chain type.
  - 6. Obstruction-Detection Device: Automatic photoelectric sensor and electric sensor edge on bottom bar.
    - a. Sensor Edge Bulb Color: Black.
  - 7. Control Station(s): Interior mounted.
  - 8. Other Equipment: Audible and visual signals
- M. Curtain Accessories: Equip door with weatherseals, push/pull handles and pull-down strap .
- N. Door Finish:
  - 1. Baked-Enamel or Powder-Coated Finish complying with AAMA 2605: Color to match existing doors at pump station.
  - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

#### 2.04 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Electrical components shall be rated for use in NEC Class 1, Division 1, Group D locations.

#### 2.05 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
  - 1. Aluminum Door Curtain Slats: ASTM B 209 (ASTM B 209M) sheet or ASTM B 221 (ASTM B 221M) extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch (1.27 mm); and as required.
  - 2. Insulation: Fill slats for insulated door with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450,

respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.

- 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum aluminum thickness of 0.032 inch (0.80 mm).
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

#### 2.06 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
  - 1. Aluminum: 0.040-inch- (1.02-mm-) thick aluminum sheet complying with ASTM B 209 (ASTM B 209M), of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

#### 2.07 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Chain Lock Keeper: Suitable for padlock.
- C. Safety Interlock Switch: Equip power-operated door with safety interlock switch to disengage power supply when door is locked.

#### 2.08 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Door: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
  - 1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous-sheet baffle secured to inside of hood or field- installed on the header.
  - 2. At door jambs, use replaceable, adjustable, continuous, flexible, nylon brushes.
- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- C. Pull-Down Strap: Provide pull-down straps for door more than 84 inches (2130 mm) high.

#### 2.09 COUNTERBALANCING MECHANISM

- A. General: Counterbalance door by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to sup-port rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

#### 2.10 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA 70.
  - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
  - 1. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
  - 1. Electrical Characteristics and Motor Size:
    - a. Minimum as indicated for each door assembly. If not indicated, large enough to start,

accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.

- 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
- 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated door, activation of device immediately stops and reverses downward door travel.
  - 1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
    - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
  - 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- G. Control Station: Three-button control station in fixed location with momentary-contact pushbutton controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
  - 1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, explosion proof NEMA ICS 6 Type 7 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

#### 2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

#### 2.12 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2605. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

#### 2.13 STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

#### 2.14 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. Run grain of directional finishes with long dimension of each piece.
  - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  - 3. Directional Satin Finish: No. 4.

#### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

A. Install overhead coiling door and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

- B. Install overhead coiling door, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling door, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Door: Install according to UL 325.

#### 3.03 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. After electrical circuitry has been energized, operate door to confirm proper motor rotation and door performance.
  - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

#### 3.04 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that door operates easily, free of warp, twist, or distortion.
  - 1. Adjust exterior door and components to be weather-resistant.
  - 2. Lubricate bearings and sliding parts as recommended by manufacturer.
  - 3. Adjust seals to provide tight fit around entire perimeter.

#### 3.05 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
- B. Perform maintenance, including emergency callback service, during normal working hours.

#### 3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling door.

#### END OF SECTION

#### SECTION 13855

#### WASTEWATER CHEMICAL FEED SYSTEM

#### PART 1 - GENERAL

#### 1.01 SCOPE

- A. This section includes the fabrication, delivery, installation, and placement into successful operation of a chemical feed system complete with a control system. This system will be complete and include chemical feed pumps, feed controls, liquid storage tank, and all piping and appurtenances required to feed chemical for odor control into a wastewater collection system. One full load of Bioxide will be provided to facilitate start-up and system optimization. All materials shall be provided in accordance with these specifications.
- B. All components of the system shall be compatible with the conditions and chemicals to which they are subjected to during the normal operation of the system. Compounds with which the materials must be compatible with include, but are not limited to:
  - 1. Hydrogen Sulfide
  - 2. BIOXIDE solution
  - 3. Magnesium hydroxide

#### 1.02 ENGINEER'S APPROVAL OF ALTERNATE EQUIPMENT

- A. The Chemical Feed System design was based on the Evoqua Water Technologies LLC. Should equipment which differs from this Section be offered and determined to be equal to that specified, such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of affected areas, including materials and labor for structures, piping, appurtenant equipment, electric, etc, required to accommodate such a substitution be made at no additional cost to the Owner and be as approved by the Engineer.
- B. Manufacturer of alternate equipment shall submit a pre-approval package to Engineer at least two (2) weeks prior to bid date. Alternate manufacturer shall submit the following information and supporting documentation:
  - 1. Standard equipment drawings showing the equipment meeting the specifications in this section. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
  - 2. Detailed installation drawings illustrating how the proposed unit fits in the space. The drawings shall include plan, elevation, and sectional views of the installation. Drawings shall include details of the tank, feed system, structural pad, and details of anchor bolt locations.
  - 3. Information on the chemical proposed.
  - 4. Information on the dosing strategy, instrumentation, and controls.

- 5. Motor characteristics and performance information.
- 6. Reference list of all installations of same and similar equipment.
- 7. Complete bill of materials for all equipment.
- 8. Documentation of required maintenance for all equipment.
- 9. Standards. All control system design, fabrication, and wiring shall conform to the National Electrical Code, standards of Underwriters Laboratories and any other applicable federal codes. Control system panels shall bear the listing of a Nationally Recognized Testing Laboratory (UL, ETL etc.).
- 10. All components of the feed system will be provided by a single manufacturer who shall have sole-source responsibility for the system.
- 11. All equipment shall be furnished by a single manufacturer who shall be responsible for the coordination of the system design.

#### 1.03 PROCESS DESCRIPTION

The system shall provide for bulk storage of chemical for odor control and metering of the chemical from the bulk storage tank to the wastewater collection system. The system shall contain controls as necessary to facilitate single discrete dosing profile (24 hour setpoints) that varies in 1-hour increments in a stepping fashion over a 24-hr period. A calibration cylinder shall be permanently installed to facilitate calibration of feed pumps. The feed system is capable of reducing chemical usage by at least 10% versus typical 2-timer systems by dosing more closely to the demand curve.

The chemical shall utilize the inherent ability of the facultative bacteria normally present in wastewater to metabolize hydrogen sulfide and other odor-causing, reduced sulfur containing compounds. The material shall provide nitrate-oxygen to the wastewater to support this biochemical mechanism. This nitrate-oxygen shall be applied via nitrate salts. The material shall be chemically stable, allowing continuous removal of sulfide contributed by side streams downstream of the application point.

#### 1.04 SUBMITTAL

- A. The manufacturer shall submit complete shop drawings and engineering data to the Owner or Engineer, upon request. These submittals shall include, at a minimum:
  - 1. Drawings showing plan and elevation views of the feed system
  - 2. Control system layout drawing
  - 3. Control systems electrical diagram
  - 4. Design of anchor bolts signed and sealed by a Missouri Professional Engineer

- 5. Manufacture's catalogue information on major system components including, but not limited to:
  - a. Chemical Feed Pumps
  - b. Chemical Feed Controls
  - c. Liquid Storage Tanks
  - d. Operator Interface
- 6. Statement of design conditions and performance guarantee
- 7. Statement of warranty
- B. Operation and maintenance manuals shall be provided by the Manufacturer prior to installation of all major equipment components. These manuals shall include at a minimum:
  - 8. Information in hazards associated with the system and the appropriate safety precautions
  - 9. All appropriate Material Safety Data Sheets
  - 10. Equipment installation instructions
  - 11. Equipment startup instructions
  - 12. Equipment maintenance procedures
  - 13. Troubleshooting guide
  - 14. Individual operation and maintenance information on major system components, including but not limited to:
    - a. Chemical Feed Pumps
    - b. Chemical Feed Controls
    - c. Liquid Storage Tanks
    - d. Operator Interface

#### 1.05 DELIVERY

- A. Fabricated assemblies shall be shop assembled and properly matchmarked for ease of field erection.
- B. All components will be erected by the Contractor immediately upon receipt from the Manufacturer or stored in strict conformance with storage recommendations provided by the Manufacturer.

#### 1.06 SUBSTITUTIONS

A. Any substitutions or deviations in equipment or arrangement from that shown on the drawings specified herein shall be the responsibility of the Manufacturer or Contractor. Any deviations must be accompanied by detailed structural, mechanical, electrical drawings and data for review by the Engineer. All costs associated with review of the substitutions or deviations and costs associated with project drawing changes as a result of approval shall be borne by the Manufacturer or Contractor. There shall be no additional costs to the Owner due to substitutions or deviations.

#### 1.07 WARRANTY

A. The Manufacturer shall guarantee that the system will perform as described in these Specifications. The Manufacturer shall warrant the system, complete, to be free from defects in materials or workmanship for a period twelve (12) months from substantial completion. The Manufacturer shall repair or provide replacement for any defective components under this warranty. In addition, the chemical storage tanks shall be warranted for a period of five (5) years from warranty start date.

#### PART 2 PRODUCTS

#### 2.01 PRODUCT INFORMATION

- A. Bioxide®
  - 1. Design Requirements
    - a. The material supplied shall be an aqueous solution of calcium nitrate containing a minimum of 3.5 pounds of nitrate-oxygen per gallon.
    - b. The material shall be capable of reducing the dissolved hydrogen sulfide concentration in wastewater to less than 0.1 mg/l.
    - c. The material shall be free of any objectionable odor producing compounds.
    - d. The pH of the material shall not be less than 4.0 or greater than 7.5.
    - e. The material shall have a freezing point less than  $-10^{\circ}$ F.
  - 2. Safety Requirements
    - a. The material shall not be listed as an Extremely Hazardous Substance under Section 302 of EPCRA, nor be listed as a CERCLA hazardous substance.
    - b. The material shall be exempt from Federal DOT placard requirements.
    - c. Recommended handling procedures for the material shall require protective gloves and safety glasses only. Any material recommending more sophisticated equipment (i.e., face shield, body suit, etc.) during routine handling shall not be considered.

#### 2.02 COMPONENTS

A. Tank

The chemical storage tank shall be constructed of Rotationally Molded High-Density Crosslinked Polyethylene (HDXLPE). No other material of construction shall be acceptable.

1. Specifications

The chemical storage tank shall be Double wall and have the following capacity and approximate dimensions (+/-5%):

Parameter	Chemical Tanks
Nominal Capacity	6,550 U.S. gal
Diameter	9'11"
Height	15' 6"
Empty Weight	3,366 lb.
Specific Gravity	1.90

#### 2. Manufacturing

- a. High density cross-linked polyethylene tanks shall be manufactured by the rotational molding process in accordance with ASTM D-1998-93 Standard Specification for Polyethylene Upright Storage Tanks.
- b. Appearance. Finished vessel walls shall be as free as commercially practicable of visual defects that will impair the serviceability of the vessel.
- c. Dimensions and Tolerance. The vessel diameter shall be measured externally. Measurement shall be taken in a vertical position.

#### 3. Material

- a. Plastics. The polyethylene shall preferably be virgin material. Any use of regrind, recycled, or reprocessed materials or combinations of such materials shall not rely upon the performance data of their original constituents but must meet the requirements of this standard in its own right.
- b. Fillers and Pigments. The plastic shall contain no fillers. All plastic shall contain an ultraviolet stabilizer. This stabilizer shall be compounded in the polyethylene. Pigments must be compounded at the same time of resin manufacture.

#### 4. Fittings

- a. All fittings with the exception of the overfill protection site glass, shall be located on the tank top or dome. No penetration of the sidewall shall be made.
- b. Plastic Fittings. Plastic fittings shall be "bulk-head" or "two-flange" style. All bolts shall be all thread design. Each bolt shall have a gasket, which is on the inside of the vessel.
- c. Openings that are cut in vessel to install fittings shall not have sharp corners. Holes shall have minimum clearance to ensure the best performance of fittings.
- d. For all flanged connectors, the flange drilling and bolting shall be in accordance with ANSI/ASME B-16.5 for 150-psi pressure class straddling the principle centerline of the vessel.

#### B. Process Feed System

5. General. The operation of the Chemical Feed System shall be controlled from a Control Panel. All equipment control switches, pilot lights, controllers, etc. and the chemical feed pumps shall be housed in this panel.
- 6. Enclosure. The control panel enclosure shall be constructed of 316 stainless steel and shall be rated NEMA 4X. It shall be equipped with a door with a continuous hinge. The hinged door shall have two latches and shall be capable of locking via a padlock. The enclosure shall be mounted on the control stand, which shall contain the heated calibration stand.
- 7. Components. The Control Panel shall contain the following:
  - 1 Touch Screen Operator Interface with color display and integrated tank level indication
  - 1 HMI On/Off Soft Switch for auxiliary equipment
  - 2 HMI Off/Auto Soft Switches for pump control
  - 1 Set of Contacts with surge arrestor to accept Tank Level device
- 8. Controls Layout. All manually operated controls (control switches, pilot lights, etc.) shall be located on a panel behind the enclosure door. The panel shall be outfitted with a main power disconnect located in the Calibration Stand.
- 9. Standards. All fabrication and wiring shall conform to the standards of Underwriter's Laboratories, National Electrical Code, and any other applicable federal, state, or local codes.
- 10. System Operation. Chemical Feed Pumps. The bellows pump shall be controlled by a two-position OFF/AUTO switch. The control system shall utilize 24 discrete dosing set points one setpoint for each hour of the day. The same 24 discrete dosing setpoint is then repeated and used for each day of the week.
  - a. When in the AUTO position, the pump shall be controlled by the advanced dosing controller. The advanced dosing controller shall vary the feed rate in 1-hour increments as specified by the user. The pumps shall be turned on and off by the advanced dosing controller to match the specified dose curve.
  - b. System shall automatically calculate the dose with either one pump or two pumps activated and the specified volume of product.
  - c. If the tank level is in alarm condition (empty, low or high) relay contacts shall be energized.
  - d. Automatic functions shall be protected by one-level security.
  - e. The chemical dosing scheme shall be a stepping function from any given hour to another.
  - f. Daily chemical dosing curve shall also be adjustable by a global setting to increase the feed rate percentage across all 24 daily set points.
  - g. System shall have selectable High-Low-Empty digital output alarms and provide for remote customer lockout contacts for remote customer shutdown.
  - h. Feed pumps shall have the capability to be interlocked with the sewage pumps and shall have the capability to be automatically shutdown on empty tank alarm.
  - i. System shall calculate be capable of providing alarms for leak detection.

- 11. Control Stand. Pump control box shall be mounted on a 316 stainless steel pedestal which contains the following:
  - a. Calibration Cylinder. The stand shall house a calibration cylinder used to measure the chemical being injected into the system. A 3-way valve shall be located at the top and bottom of the calibration tube to facilitate flow measurement. Access inside this pedestal shall be accomplished through a door located on the front of the pedestal. Instructions for use of this cylinder shall be permanently affixed to the interior of the enclosure.
  - b. Disconnect Switch. A main power disconnect shall be located in the control stand.
  - c. Heater. The stand shall be heated via a thermostatically controlled heater.

# C. Pumps

12. General. Provide Bellows Pump(s) as shown on the following table. Each pump shall include motor, base, sealed bearings, flexible coupling and check valve filters.

Quantity	Model No.	Bellows Size	Adjustable Flow Rate Range (mL/min)	Max Discharge Pressure (psi)
1	15908-002	1.5"	105-1050	20
1	15908-003	1.5"	150-1500	20

- 13. Performance. Pump rates and maximum discharge pressures shall be in accordance with the table above.
  - a. The pumps shall be self-priming capable of suction lifts, when dry, up to seven (7) feet, and with bellows full, they will prime up to twenty (20) feet.
  - b. Flow rate of each pump shall be adjustable by (a) diameter of bellows, and (b) adjustment of stroke length. A calibration cylinder and valves will be installed to calibrate the pump feed rates.
  - c. Pump suction and discharge shall be 3/8" ID polypropylene barbed connection for "T" tubing. A 1-1/2" wye strainer will be installed.
- 3. Construction Material

BellowsPolypropylenePoppet valvesEPT®O-ringsEPT®SpringsHastelloy C	Reference	Material
	Bellows Poppet valves O-rings Springs	Polypropylene EPT <sup>®</sup> EPT <sup>®</sup> Hastellov C

4. Motors. Motor shall be totally enclosed 115 volt, 60 Hz, 0.034 HP, single-phase and shall be rated for continuous duty.

- D. Piping & Appurtenances
  - 1. All suction and discharge piping shall be standard <sup>1</sup>/<sub>2</sub>", Schedule 80 PVC. All valves, fittings, and connectors shall be Schedule 80 PVC.
  - 2. All fill line piping shall be 2" Schedule 80 PVC. All fill line valves, fittings, and connectors shall be Schedule 80 PVC.
  - 3. Fill line shall have a 2" stainless steel male camlock with a 2" plastic female camlock cap.
  - 4. All chemical feed seals shall be compatible with the chemicals to be used in the regular operation, maintenance, and cleaning of the feed system.
  - 5. All fittings shall be solvent-welded or threaded.
  - 6. Contractor must install chemical feed discharge lines so that the product is injecting directly into the waste streams and not onto structures or equipment.
  - 7. A wye strainer shall be installed on the suction line.
- D. Level Indication
- E. The manufacturer shall provide one pressure transducing tank level sensor which utilizes the VDLT control panel.

# PART 3 EXECUTION

# 3.01 INSTALLATION

A. The system shall be installed in accordance with the manufacturer's instructions. All installation personnel shall be trained and qualified in the areas of plumbing, electrical work, and instrumentation as required to complete the installation.

## 3.02 SITE AND UTILITIES

- A. The completed system, tanks, and other appurtenances shall be located on a foundation as shown in drawing. The following utilities shall be provided at the feed system site and located as shown on the drawing and as indicated in the approved project proposal. Site preparation and utility service, are not provided by the Manufacturer under these specifications.
- B. Electrical. One 120 VAC, 60 Hz, 15 amp single-phase electrical service shall be required.
- C. Concrete Foundation
- D. All trenching excavation and backfill.
- E. Flow sensor if applicable.

## 3.03 EQUIPMENT SHOP TESTING

Before shipping the chemical feed system, the manufacturer shall perform shop tests. These tests shall include at a minimum:

- A. Visual inspection of all equipment.
- B. Complete assembly, start-up, and "wet-test" of feed pumps and calibration piping.

## 3.04 STARTUP AND TRAINING

- A. The manufacturing of chemical feed system shall furnish a factory-trained representative for not less than one (1) day for the feed systems supplied. The days shall not necessarily be consecutive; however, the times shall be mutually agreed upon by the manufacturer, Contractor, and Owner.
- B. A day shall be considered as 8 hours. The factory-trained representative shall perform the following:
  - 1. Check the installation and put each piece of equipment into initial service.
  - 2. Train and instruct the operating personnel in the proper operation of the equipment and in the proper maintenance of the equipment.

# 3.05 FIELD TESTS

- A. The performance of the system shall be in accordance with the terms of the process description in section 1.3 of Part 1 of this document.
- B. If required, Manufacturer shall make any changes to the system, at his own expense, that may be necessary to assure satisfactory and efficient operation of this system.

# END OF SECTION

une 2022TAYLOR RICH 1:2.5849

K:\netjob2\19-1680\6.0\_design\structural\s101.dwg



SCALE: 1/16" = 1'-0"











				2		
SCHEDULE O	F ADDED E	QUIPMENT FC	DR EXISTING MOTOR CO	NTROL CE	NTER "N	/ICC-1''
ELECTRICAL LOAD	HP FLA	**REQUIRED CIRCUIT BREAKER	WIRE AND CONDUIT SIZE	MCC	BUCKET NO.	CIRCUI <sup>-</sup> NO.
GATE OPERATOR-9	1 hp 2.1 A	15A, 3P 480VAC	(3)#14, (1)#12G, 3/4"C	MCC-1	1A(1)	16
GATE OPERATOR-11	1 hp 2.1 A	15A, 3P 480VAC	(3)#14, (1)#12G, 3/4"C	MCC-1	1A(1)	17
VAPEX -1	30 A	2P 40A 208VAC	(2)#10, (1)#10G, 1"C	MCC-1	2C⑦	3
VAPEX -2	30 A	2P 40A 208VAC	(2)#10, (1)#10G, 1"C	MCC-1	2C⑦	4
SCREEN-1	1 hp 2.1 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-1	1G(4)	5
SCREEN-2	1 hp 2.1 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-1	2A6	6
CONVEYOR	2 hp 3.4 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-1	2E(8)	7
GATE OPERATOR-2	1 hp 2.1 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-1	1C(2)	8
GATE OPERATOR-3	1 hp 2.1 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-1	1C(2)	9
GATE OPERATOR-4	1 hp 2.1 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-1	1E3	10
GATE OPERATOR-7	1 hp 2.1 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-1	1E3	14
GATE OPERATOR-8	1 hp 2.1 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C MCC-1		1G <b>(</b> 4)	15
ROLL-UP DOOR	1 hp 2.1 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-1	1K(5)	20
SCHEDULE O	F ADDED E	QUIPMENT FO	OR EXISTING MOTOR CO	NTROL CE	NTER "N	/ICC-2"
ELECTRICAL LOAD	HP FLA	**REQUIRED CIRCUIT BREAKER	WIRE AND CONDUIT SIZE	MCC	BUCKET NO.	CIRCUI <sup>-</sup> NO.
EF-5	5 hp 7.6 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-2	1A(1)	11
MAU-2	15 hp 21 A	3P 40A 480VAC	(3)#8, (1)#8G, 1"C MCC		3A(1)	12
MAU-4	15 hp 21 A	3P 40A 480VAC	(3)#8, (1)#8G, 1"C	MCC-2	3A(1)	13
MAU-1	15 hp 21 A	3P 40A 480VAC	(3)#8, (1)#8G, 1"C MCC-2 (3)#8, (1)#8G, 1"C MCC-2		1G④	1
MAU-3	15 hp 21 A	3P 40A 480VAC			1G(4)	2
EF-1	3 hp 4.8 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-2	1C(2)	18
EF-6	5 hp 7.6 A	3P 15A 480VAC	(3)#12, (1)#12G, 3/4"C	MCC-2	1E3	19
<b></b>						

\*CONTRACTOR SHALL PROVIDE CIRCUIT BREAKER AND ALL BREAKER MOUNTING EQUIPMENT FOR THE EMPTY BUCKET DESIGNATED. CONTRACTOR SHALL PROVIDE A NEW DOOR FOR ACCESS TO THE BREAKER HANDLE. CONTRACTOR SHALL PROVIDE ENGRAVED PLASTIC LABELS SHOWING DESIGNATED LOAD. SECURE LABELS IN PLACE WITH SCREWS.

\*\*EXISTING CONNECTED CIRCUITS ARE NOT SHOWN IN THIS TABLE

\*\*\*FOR MORE INFORMATION REGARDING CONDUIT AND WIRE SEE GENERAL ELECTRICAL NOTES 2, 3 AND 4 THIS SHEET.



ELECTRICAL SCHEDULE KEYED NOTES

 $\langle$  7  $\rangle$  EXISTING 480V X 208Y/120V TRANSFORMER TO REMAIN





# ELECTRICAL GENERAL NOTES

- CONTROL WIRE SIZE AND QUANTITY AND TYPE IS SHOWN ON THE CONTROLS ONE-LINE DIATRAM, SHEET IC-107 IN THIS DRAWING SET.
- 2. POWER CONDUCTORS SHALL BE IN RIGID ALUMINUM CONDUIT SUPPORTED BY STAINLESS STEEL STRUT AND STRAPS, AND RODS WITH STAINLESS STEEL FASTENERS AND ANCHORS. IN THE WETWELL, AND ON THE SCREEN ROOM FLOOR, CONDUIT SHALL BE RIGID ALUMINUM WITH VINYL COVERING. BOXES AND FITTINGS SHALL BE NEMA 7. EXTERIOR BOXES AND FITTINGS SHALL BE NEMA 4X WITH RIGID ALUMINUM CONDUIT.
- 3. CONDUCTORS SHALL BE TYPE XHHW-2 TINNED COPPER THROUGHOUT.
- CIRCUIT NUMBERS SHOWN ON EXISTING MCC'S MOTOR CONTROL CENERS MCC-1 AND MCC-2 INDICATE THE CONNECTION BETWEEN CIRCUIT BREAKERS AND THE LOADS IDENTIFIED IN THE TABLE ON THIS SHEET.
- 5. CONTRACTOR SHALL PROVIDE ALL MATERIAL, INCLUDING THE CIRCUIT BREAKER AND BREAKER INSTALLATION EQUIPMENT, DOORS, BRACKES, ETC, CONDUIT AND WIRE AS SHOWN IN THE TABLES ON THIS SHEET AND AS NOTED ELSEWHER ON THE DRAWING,
- 6. WALL AND FLOOR PENETRATIONS AND SUPPORTS AS DETAILED ON THE DRAWINGS, AND ALL WORK AND RE-WORK NECESSARY FOR A COMPLETE AND WORKING ELECTRICAL SYSTEM.
- 7. CURRENT CARRYING CONDUCTORS AND EQUIPMENT GROUNDING CONDUCCTORS SHALL BE TINNED COPPER CONDUCTORS WITH THWN INSULATION. OTHER CIRCUITS SHOWN ON PLANS BUT NOT INCLUDED IN THESE TABLES SHALL BE OF LIKE MANUFACTURE.
- 8. WALL AND FLOOR PENETRATIONS BETWEEN RATED AND NON-RATED AREAS SHALL BE PROVIDED IN ACCORDANCE WITH DETAILS SHOWN ON SHEET E500 IN THE DRAWINGS. EXTERIOR WALL PENETRATIONS SHALL BE PROVIDED IN ACCORDANCE WITH DETAILS SHOWN ON SHEET E500.
- 9. CONTRACTOR SHALL PROVIDE A TYPEWRITTEN LOAD LIST FOR MCC-1 AND MCC-2, SECTION 1 AND MCC-2, SECTION 2. EXISTING AND ADDED LOADS SHALL BE INCLUDED IN THE LOAD LIST.
- 10. CONTRACTOR SHALL NOT ENTER CONDUIT THROUGH THE TOPS OF MOTOR CONTROL CENTERS.

ADDENDUM #3 KC WATER SERVICES COMMENTS, ADDED EQUIPMENT 6-15-22

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS HEREON ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

PROFESSIONAL ENGINEER SEAL	KANSAS CITY, MISSOURI, WATER SI	ERVICES DEPARTMENT
TED R WI SON DE DE DE R WI SON DE R SON DE R SON DE R SON DE R SON DE R SON DE R SON DE R SON DE	FACILITY IMPRO SCREEN REPLA BIRMINGHAM PUMPIN 11011 NE BIRMINGH KANSAS CITY,	OVEMENT ACEMENT NG STATION AM ROAD MO
FOR WSD USE:	BID DOCUMENT S	UBMITTAL
	MOTOR CONTROL	CENTERS
	DRAWN BY CHECKED BY DATE SUBMITTE	D RANGE TWP SEC
	TRW IRW 6/29/22	XX XX XX
	CONTRACTOR	DATE COMPLETED
	CONTRACT NO.CONTRACT DATEMAP NO.1662XXXX	WORK ORDER NO. DRAWING NO. E-200
	PROJECT NO. 81000928	SHEET 47 OF 60
•		



# PLANS FOR SEWERAGE IMPROVEMENTS

# POLLUTION CONTROL DEPARTMENT KANSAS CITY, MISSOURI

# CONTRACT NO. 111 SECTION BIRMINGHAM PUMPING STATION

SHOAL CREEK INTERCEPTOR D90 (BY OTHERS) BIRMINGHAM PUMP STATION DIII SECTION 1 BIRMINGHAM FORCE MAIN DIII SECTION II (BY OTHERS) BIRMINGHAM SEWAGE TREATMENT PLANT SITE DII5 (BY OTHERS) OUTFALL LINE DIII SECTION III (BY, OTHERS)

**PROJECT NO. 3292 D 111** 

**BLACK AND VEATCH** CONSULTING ENGINEERS KANSAS CÌTY, MISSOURI

A . . . .



~ × ~ 17

MICROFILMED ほじてい 1. <u>1. 1</u>. 1. D-1322.02 /

A state the second state





			· · · · · · · · · · · · · · · · · · ·
	10/4/11	Kevised	GVD
	KAN POLLUT	NSAS CITY, MIS	SOURI
	BIRMIN	IGHAM PUMPING ELEVATIONS	STATION
CONFORMED TO CONSTRUCTION RECORDS	B	LACK & VEATCH B ENGINEERS, KANSAS CITY, MO.	P.C.D. CONTRACT
	DESIGNED EMP DETAILED EMP	CHECKED J.L.W. 7/1/2 APPROVED 0-23-74 DATE 0-23-74	SHEET 2 OF 50
		MIUR:	D-1322.02





















بديد م





10/4/77 Revised GVD KANSAS CITY, MISSOURI POLLUTION CONTROL DEPARTMENT BIRMINGHAM PUMPING STATION ELEVATIONS ANDE JELL P.C.D. CONTRACT BLACK & VEATCH CONFORMED TO INTRUCTION RECORDS 1 1 1 1 4 4 4 X 1 5 6 - 5 4 5 4 7 1 6 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 4 5 4 7 1 7 - 5 7 1 7 - 5 7 1 7 CONSULTING ENGINEERS, KANSAS CITY, MO. DIII-I 11-3-11 670 26 DESIGNED <u>EMP</u> DETAILED <u>EMP</u> CHECKED J.L. WMIII SHEET 3 OF 50 101833 MICROFILMED D-1322.02

أيكف بمكاملا المماريا المراميحين









. 1



Note: ote: Contractor is to remove exist. brick e block bulkhead from exist. spigot end pipe, provide closure piece between exist. pipe and influent structure, grout joint between new and exist. pipe and handle infiltration. Exist. 120" R.C.P. Installed under Contract D90 10/5/77 Revised GVD KANSAS CITY, MISSOURI POLLUTION CONTROL DEPARTMENT BIRMINGHAM PUMPING STATION SECTION 37 11139 P.C.D. CONTRACT BLACK & VEATCH CONFORMED TO / CONSTRUCTION RECORDS DIII-I CONSULTING ENGINEERS, KANSAS CITY, MO. DESIGNED K.OB DETAILED W.J.D. CHECKED J.L.W. ALLASTA APPROVED DATE 8-23-740 SHEET 6 OF 50 1072351 MICROFILMED D-1322.027

ъ



	•					
•					· "	
						,
						9 1
		r .	· ·	•		*
·				,		
						ť
			X			
· (						
						\$
		10/5/77	Revis	acd	GVL	)
		KAN POLLUTI	SAS CI ON CON	TY, MIS	5SOUR EPARTN	RI MENT
	· · · · · · · · · · · · · · · · · · ·	BIRMIN	GHAM 🕓 P	UMPING	STATI	ΟΝ
	11.040		SEC	CTION		9 1011-101-101-101-101-101-101-101-101-10
		BL	ACK & VEAT	СН	P.C.D.	CONTRACT
CONFORME TO CONSTRUCTION RECORDS		CONSULTING	ENGINEERS, KANS	AS CITY, MO.		
CONFORMED TO CONSTRUCTION AECORDS 11. 947 77. 4. 0. CONCOMP		CONSULTING DESIGNED K.O.B. DETAILED W.J.D.	ENGINEERS, KANS CHECKED APPROVED DATE	AS CITY, MO.		HEET OF 50

× ...





s fulls linka lange an an sea that he an a a s

and the second second

A physical sector is a second second field to second the distance of the second s second sec second sec ر اسم الا و داخل الماد الماد الماد الماد المحافظ المستمر المحافظ من المستمر الماد الجهد المركز إلى الم المركز ا















<u>er e.</u> 14

un den na fan die kennen en de			ROOM	FINISH	SCHEDULE		*
solution solution for the solution solution of the solution of	NO.	ROOM Sestibule	Elbor Material BA Walt Material	Can bik. Panel Iner M Concrete T	Zx4       Lay-in       Panel       O         Exposed       Constr.       FI         O       Visition       O	CEILING HEIGHT	REMARKS
grind smooth	2 3 4 5 6 7 8 9	Janitor Janitor Toilet Locker Room. Storage Storage Screen room Motor room				7-114 7-114 7-114 7-114	• • • • • • • • • • • • • • • • • • •
mooth metal wall //2"Insula Liner pane	pana ticn ticn tipp	e/ v):		OR SCHE		n balan sakilan yan din din din din din din din din din di	
HEAD JAMB JAMB SILL G G (7) S 4	The the second s	DR. DOOR OPENING 1 3'-9' x 7'-93/4" 2 3'-0' x 7'-2" 3 3'-0' x 7'-2" 4 3'-0' x 7'-2" 6 3'-0' x 7'-2" 8 3'-0' x 7'-2" 10 3'-0' x 15'-0" 10 3'-0'' x 15'-0" 11 Pair 2'-10'' x 7'-934" 12 12'-0'' x 15'-0" 13 Pair 3'-0'' x 7'-2" 14 3'-0'' x 7'-2" 15 3'-0'' x 6'-6" 16 3'-0'' x 7'-2" 17 Pair 2'-10'' x 7'-2 18 3'-0'' x 7'-2" 19 3'-0'' x 7'-2" 19 3'-0'' x 7'-2" 10 3'-0'' x 7'-2" 17 Pair 2'-10'' x 7'-2 18 3'-0'' x 7'-2" 19 3'-0'' x 7'-2" 19 3'-0'' x 7'-2" 10 3'-0'' x 7'-2" 10 3'-0'' x 7'-2" 11 Pair 2'-10'' x 7'-2" 12 3'-0'' x 7'-2" 13 3'-0'' x 7'-2" 14 3'-0'' x 7'-2" 15 3'-0'' x 7'-2" 17 Pair 2'-10'' x 7'-2" 18 3'-0'' x 7'-2" 19 5'-0'' x 7'-2" 19 5'-0'' x 7'-2" 10 5'-0'' x 7'-2" 10 5'-0'' x 7'-2" 10 5'-0'' x 7'-2" 10 7'-2" 10 7'-0'' x	WALL OPN $8'-0/2" \times 8^{3}-0"$ $3'-4" \times 7'-4"$ $3'-4" \times 7'-4"$ $3'-4" \times 7'-4"$ $3'-4" \times 7'-4"$ $3'-4" \times 7'-4"$ $3'-4" \times 7'-4"$ $3'-4" \times 15'-0"$ $3'-4" \times 15'-0"$ $6'-0'' \times 15'-0"$ $6'-0'' \times 7'-4"$ $3'-4" \times 6-8''$ $3'-4" \times 7'-4"$ $3'-4" \times 7'-4" \times 7'-4"$ $3'-4" \times 7'-4" \times 7'-4"$ $3'-4" \times 7'-4" \times 7'-4"$ $3'-4" \times 7'-4" \times 7'-4" \times 7'-4"$ $3'-4" \times 7'-4" \times 7$	IG TYPE EL H.M. E do E do E do E do E do E do E do E H.M. E Rolling Steel H.M. E H.M. E H.M. E H.M. E H.M. E H.M. E H.M. E C H.M. E C H.M. E H.M. E H.M. E C H.M.	EV HEAD JAM H4 J44J3 H5 J4 H3 J3 H3 J3 H4 J4 H4 J4 H4 J4 H4 J4 H4 J4 H4 J4 H4 J4 H4 J4 H4 J4 H2 J14J H3 J3 H3 J3 H4 J4 H4 J4 H5 J4 H3 J3 H3 J3 H	ESILL $53  +55$ See 51 1 1 53 11 53 11 53 5e 53	REMARKS $: sh, 4 \notin 18$ " " $\notin$ this Sh. " " $\#$ this Sh. " " " $\#$ this Sh. " " " $\#$ this Sh. " " " " " " " " " $\#$ this Sh. " " " " " " " " " " " " $\#$ this Sh. " " " " " " " " " " " $\#$ this Sh. " " " " " " " " " " " " " " " " " " "
e 5kylic,	jht,	Note; Miscellaneou greater than provide L 3/2 (3/2 1/20 borz)	DOOR 15 masonry 1-8" but not x 2/2 x 1/4 for 1 enoth of	ELEV Scale: 4 ppening: greater rea. 4" misc. in	ATIONS = 1-0" s w/spans than 5-4" vythe of w tels shall	oll,	````
clip L faste ¢anchored	nto to f	frame 1. as requ	1.4" (B" MIN, 10/10/17	bearing	ea, jamb		GVD
Flashing, ancho concrete slab. in colkingi	r to, Sat	States and the states of the s	KA POLLU BIRMI ENLARG	NSAS TION C NGHAM ED PAR	5 CITY, CONTRO PUMPIN TÍAL PLAN	MISS L DEP G STA N & DOO	OURI ARTMENT TION R DETAILS
CONFORMED TO CONSTRUCTION RECO	RDS HEEKED	ANNA INC.	CONSULT DESIGNED EMP DETAILED EMP	BLACK &	CHECKED J.L.W	(, MO. 1117 . 1415 . 1415 . 1415 . 1415 . 1415 . 1415 . 1415 . 1415 . 1415 .	P.C.D. CONTRACT D III - I SHEET I6 OF 50

the second se

MICROFILMED

D-1322 02
























DEAM	TYPE	Ь	+	TOP	BOTTOM	STIRRUPS	REMARKS
A+1	T	24	54	6-#10	6-#10	#4@12"	
A-1 A-2	TIVEV	34	24	8-#8	8.48		Bee section 3h. 20 for
1.3		18	51	1-#9	4-#8	#4@16'	<u></u>
A-J	IVEV	18	54	4-#9	4-#8	#4@16"	•
A-5	VI	24	30	2-46	2-#6	#1.016"	See Section for A-5 this sh
Δ-ία		12	Vories	6-#10	3-#5	#4@12"	See detoil this Sh.
A-7	1r	12	36	3-#6	3.#6	#3@12 "	
A-8	VI VI	.18	30	4-#8	1-#8	#4@16"	
A-9	MINEI	12	30	3-4.7	3-47	a a ann ann an t-ann an t-ann ann an t-ann ann ann ann ann ann ann ann ann ann	Bee Bection A-9 this Sh.
4.10	IVER	12	30	3-47	3-47	#3@12"	
A-11	$I\!I$	12	24	3-#7	3-#7	<i>‡3@12</i>	
4-12	VL	12	21	3-#5	3-#5	#3@12"	
4-13	VI.	12	24	3-#7	3-#7,	#3@12"	
				<ul> <li>Second contraction of the second s</li></ul>	a na fanan a fanai na allana na allana na allana na antina na antina ana allana ana allana ana a		
8-1	e magazangan, ana mangang magana pangana pangana ang mangana pangana pangana pangana pangana pangana pangana pa	36	42.	8-#11	7-#10	#5@12."	See detail this Sh.
B-IA	I	36	42	8-#11	7-#10	#5@12"	
8-2		24	60	6-#10	4-#10	#4@12"	3ee detail this Sh.
8-3	<u>VI</u>	12	60	3-#8	3-#7	#3@12"	Belt beam
B-4	ΠĽ	18	60	4-#9	4-#8	#4@16"	
8-5	I	18	60	4-#9	4-#8	\$4@16"	
B-6	III	12	48	3-#8	3-48	#3@12"	Belt beam
B-7	III	12	48	3-48	3-48 -	<i>#3@12."</i>	Belt beam
3-8,9\$10		24	64	6-#9	6-#9	#4@12"	Beltbeam, See Dt'ls., Sh.8
B-11	· · · · · · · · · · · · · · · · · · ·	24	Vories				See detail this Sh.
Cal	T	21	12	10-49	10-49	#4@12"	
C-7	TTT	24	40	5-#7	5-#10	#4@16"	Belt beam
<u>C-3</u>	TTAT	30	100	7-49	7-#8	#5@16"	Belt beam
<u>c-1</u>	TTT	30	60	7-#9	7-#8	#5@16"	Belt beam
C-K	TTT	18	42	4-#9	4-#8	#3@9"	она. В дани у ради и на на начи на и и и и и и и и и и и и и и и и и и
C-12	T T	IA IA	42	4-#9	4-18	73@9"	
C.7	TET	34	48	9-19	10-49	<i><b>#5@12</b>"</i>	Belt beam
C-a	777	34	18	9-#9	6-#9	#5@12"	Belt beam
0-9/11/1	2	36	54	9-#11	9-#11	#5@12"	Belt beam, See Dt'ls., Sh.C
, 0,10,11 ¥1)						• Consideration and a constraint of the const	
n Ant hanged daarpeger i paaks of i dy araan	с - 41 			90 ya 1 - 20 ana ana ana ang ang ang ang ang ang ang	n gana a na ang ang ang ang ang ang ang	n haan in a gemeinte van terrener of it op nover i den terrener oor op de seer op de seer op de seer op de seer	2210 American ang ang ang ang ang ang ang ang ang a
s. Na annur unfördnungennykynymetrifer rennd sin i	ing ang ang ang ang ang ang ang ang ang a						
an ann a bha tha tha an gu ann an an tairt an ann ann					1919 - Hannes Hannes,	namer namer i name alle state alle state alle state en	
aller minister von die eingeberte liefen dass ein diese schaft werden ministeren	ngente Angle anglebangat agity somet i south transmission gas all statistical his		and a construction of the second s		na de la segunar recente con langementar que con en la segunar a servici		

• • •

1

\*

		nahangka-dikantak kan dia - wanakananakan	COL	.UMN	SCHED	ULE	L. Se
COLUMN NO.	a	6	a bars	b bars	ties	REMARKS	50
WW.I-WW.B	12	12	4-#6	andre an anna an a	#3@12"		
. WW·9	24	24	6.=#11	2-#11	44@12"		ange anne fa f

Dowels, same size & numbers as "a" and "b" bars

![](_page_73_Figure_6.jpeg)

![](_page_73_Figure_7.jpeg)

![](_page_73_Figure_8.jpeg)

![](_page_73_Figure_9.jpeg)

![](_page_74_Figure_0.jpeg)

\$

No.

× \*\$

\* •

C SAC

1

1 1			k		·	
	C(	OLUMN	SCHE	DULE	ar fallan a fallan a na sa	
Column Number	Elevation Top of Bolt	Base Plate	Column Size	Elevation Bottom of Base Plate	Elevation Top of Column	Girt Type
A-1, A-10	744.30	10:9:2	W8+28	744.13	755.68	Ē
A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9	744.30	10",9", 3,"	W8+28	744,13	755,6B	А
A'-1, A''-1, A'-10, A''-10, B''1, B''-1	744.30	10#9".3"	W8+10	744.13	755.68	А
B-1	744.30	10":9": 3	W8+28	744.13	755.68	D
8-2, 8-3, 8-4, 8-5, 8-6, 8-7, 8-8, 8-9	744.30	14 + 12 + 34	W12,58	744.13	767.52	
8-10	744.30	14+12+3	W12+58	744.13	767.52	Γ
8-11	744.30	14" 12" 34"	W12,58	744.13	767.52	F
8'-11, 8"-11	744.30	14 +9 + 74"	W12+27	744.13	767.52	B-2
C-1	744.30	10:9:3	W8.10	744.13	755.68	G
C-2	744.30	14 * 12 * 3"	W12,58	744,13	767.52	Ј¢н
C-3, C-4, C-5, C-6, C-7, C-8, C9, C-10	744,30	14 * 12 * 3 #	W 12+58	744.13	767.52	B-1
C-11	744,30	14",12", 3"	W12+58	744,13	767,52	С

+ 4 · 1

. . .

£ 1

1 Aline 1

- <u>5</u>

![](_page_74_Figure_4.jpeg)

5

•

TYPICAL COLUMN DETAILS

![](_page_74_Picture_6.jpeg)

123 A

![](_page_75_Figure_0.jpeg)

![](_page_75_Figure_1.jpeg)

4

![](_page_75_Figure_2.jpeg)

COLUMN ROW C

 $\gamma \sim c$ 

3/16"=1-0" Scale

.

الم وم معمونيسوس

e - 4

![](_page_75_Figure_6.jpeg)

DESIGNED K.O.B. DETAILED W.J.D.

MICROFILMED

CHECKED J.L. WALLAND

D-1322.02 

sheet 29 of 50

![](_page_76_Figure_0.jpeg)

....

à

![](_page_76_Figure_1.jpeg)

**\* \*** \* . <u>`</u>...

![](_page_77_Figure_0.jpeg)

![](_page_78_Figure_0.jpeg)

![](_page_79_Figure_0.jpeg)

ىقىمۇرى رىيىلىمىرىغى جىلاركىيە بىرىكە بىيىرى بەركىرىغىرىغىڭ رارا مەرمە بىرىدە بىرىيە بىيەتكىكىكىكى بەر بارا بار

![](_page_80_Figure_0.jpeg)

Revised April 13, 1. Revised and Redr Revised August 1,1

LENGTH OF EMBEDMENT FOR END ANCHORAGE OF REINFORCING IN INCHES						
P BARS	OTHERS					
13	12					
17	12					
21	15					
27	. 19					
37	26					
48	35					
61	44					
78	5.6					
96	68					

13:0

169

93

120

![](_page_80_Picture_10.jpeg)

Std. 90° Hook.

Note: Vertical reinforcing not shown.

B=Sufficient length to permit bars to extend through the wall to the opposite face and terminate in a standard hook but shall not be less than the length required for embedment of top bars, as shown on this sheet.

# TYPICAL CORNER REINFORCING DETAILS

-All reinforcing bars shown to be #4

Weld all bars together at junctions to develop full bar strength

CONCRETE	COVER	FOR	REINFORCEMEN

LOCATION Unformed surfaces adjacent to excavation

MINIMUM COVER

13"

Formed or top surfaces exposed to weather or saturated air, submerged or in contact with earth

#6 or larger bars #5 or smaller bars

Other locations

Bars in beams or girders, including stirrups and column spirals or ties Slabs, walls and joist #14 and #18 #11 and smaller

Cover for reinforcing steel shall not be less than the minimum given above ( no minus tolerance ), and shall not exceed the minimum by more than /4 inch where the concrete thickness is 24 inches or less, or more than /2 inch where the concrete thickness is more than 24 inches.

D = not less than the length required for lapped splices for top bars, as shown on this sheet.

> CONFORMED TO CONSTRUCTION RECORDS 0416 0V CHECKE

KANSAS	S CITY, I	MISSOURI
POLLUTION	CONTROL	DEPARTMENT

BIRMINGHAM PUMPING STATION STANDARD CONCRETE DETAILS

BLACK & VEATCH	P.C.D. CONTRACT
CONSULTING ENGINEERS, KANSAS CITY, MO.	DIIII
DESIGNED H. H. BT. M.TR.E.S CHECKED H.H.B CALIFORE.S ' DETAILED J.W.K-R.F.S. APPROVED ALGUID TRACED L.S.F A.C.W. DATE -23-74	sheet 34 of 50
MICKUFILMED	D-1322.02

![](_page_80_Figure_32.jpeg)

![](_page_81_Figure_0.jpeg)

\$

				ંહ			LEGEND
FIXTUR	E RUNO	DUT	SCHE	DUL	E		Sanitary waste or drainage above
ingen ander en er er en ander en er er en en en en er		WA	TER	SANT	TARY		grade.
FIXTURE	SYMBOL	HOT	COLD	WASTE	VENT	<b>N</b>	Suma dischases
WaterCloset	W.C.	-	1	4	2		Sump orschurge Vant
Lovatory	Lov.	1/2	1/2	1/2	1/2		Cold water
Urinal	Ur.		3/4	2	1/2		Hot woter
Service Sink	5.3,	1/2	3/4	3	1/12	C.Q.	Cleanout
	er og generalen de det keldigen digen den in de namme seldeken			-		F. O.	Floor drain
						<i>R</i> . <i>D</i> .	Roof drain

		-

And the Charles	
1111353	
The second states and second states	

					-
10/7/77	Re	vised		GVD	
KANS POLLUTIO	SAS ( N CO	CITY, MIS	SSC EPA		ENT
BIRMING P	HAM IPING	PUMPING SCHEMAT	ST ICS	ΓΑΤΙΟΙ	N
BLA CONSULTING EN	CK & VE	EATCH KANSAS CITY, MO.		P.C.D. CON	NTRACT
DESIGNED KOB DETAILED RLG, WJD	CHECK	KED_J.L.W.	; ; /	35 SHEE	<sup>eT</sup> 50

![](_page_82_Figure_0.jpeg)

![](_page_83_Figure_0.jpeg)

, Interneting the second secon	ny na manana ang ang ang ang ang ang ang ang an	n de en general de la constant de la	ningkangkangkangkangkangkangkangkangkangka	
A CONTRACTOR OF	arne en arrente de la company de la comp			alonomikan antikun matiku ka

-

•

• \*

# <u>\*</u>

\* 5

á.

\*\* et

\$ P

namin anian ng Kalipinan a kan Palan permina	galanting tige spectra con ter state or a
EATER	SCH

	UNIT HEATER SCHEDULE												
UNIT NO.	LOCATION	OUTPUT BTU7/HR	TRANE MODEL NO.	ELEVATION TOP OF UNIT	FLOW G.P.M.	CONTROL NO.	UNIT NO.	LOCATION	OUTPUT BTU/HR	TRANE MODEL NO.	ELEVATION TOP OF UNIT	FLOW G.P.M.	CONTROL NO.
ŲĤ-1	Storage Room	20,000	42-S	7'42.00 I	- 2	T-1	UH-31	EI. 724.00	10,500	20 -WF	734.00	1.5	T-20
UH-2	Screen Room	20,000	42-S	744.00	2	1-2	`UH-32	EI. 724.00	10,500	20-WF	734.00.	1.5	T-21
UH-3	Screen Room	20,000	42-S	744.00	2	T-2	UH-33	E1. 724.00	10,500	20-WF	734.00	1.5	1-21
UH-4	Screen Room	20,000	42-S	744.00	2	T-3	UH-34	Not Used		r.	4		•.
UH-5	Screen Room	20,000	42-S	744.00	2	T-3	UH-35	EI. 706.00	10,500	20-WF	716.00	1.5	T-23
UH-6	Screen Room	20,000	42-S	744.00	2	T-3	UH-36	EI. 706.00	10,500	20-WF	716.00	1.5	T-24
UH-7'	Screen Room	20,000	42-S	744.00	2	T-4	UH-37	EI. 706.00	10,500	20-WF	716.00	1.5	T-25
UH-8	Screen Room	20,000	42-S	744.00	2	T-4	UH-3 <b>8</b>	EI. 706.00	10,500	20-WF	716.00	1.5	I-26
UH-9	Storage Room	20,000	42-S	742,00	2	T-5	UH-39	E1. 694.00	10,500	20-WF	• 695.50	1.5	1-27
UH-10	Storage Room	20,000	42-S	742.00	2	T-5	UH-40	E1. 694.00	10,500	20-WF	695.50	1.5	T-28
UH-İI	Screen Room	20,000	42-S	744.00	2	T-6	UH-41	EI. 694.00	10,500	20-WF	695.50	1.5	T-29
UH-12	Screen Room	20,000	42-S	744.00	2	1-6	UH-42	EI. 694.00	10,500	20-WF	695.50	1.5	T-29
UH-13	Screen Room	20,000	42-S	744.00	2	T-7	UH-43	EI. 694.00	10,500	20-WF	695.50	1.5	T-30
UH-14	Screen Room	20,000	42-S	744.00	2	1-7	UH-44	EI. 694.00	10,500	20-WF	695.50	1.5	T-30
UH-15	Motor, Room	34,600	60-S	754.00	4	T-12	UH-45	EI. 694.00	10,500	20-WF	695.50	1.5	T-31
UH-16	Motor Room	34,600	60-S	754.00	4	T-12	UH-46	EI. 694.00	10,500	20-WF	695.50	1.5	T-31
UH-17	Motor Room	34,600	60-S	754.00	4	T-13	UH-47	E1. 694.00	10,500	. 20-WF	695.50	1.5	T-32
UH-18	Motor Room	34,600	60-S	754.00	4	T-13	UH-48	E1. 694.00	10,500	20-WF	. 695.5 <b>0</b>	1.5	T-32
UH-19	Motar Room	34,600	60-S	754.00	4	T-14				×.		·	s.
UH-20	Motor Room	34,600	60-S	754.00	4	T-14	-						
UH-21	Mótar Room	34,600	60-S	754.00	4	T-15				H D L			
UH-22	Motor Room	34,600	60-S	754.00	4	T-15	C=1	Stairwell No: 1	9,900	32"x6"x44"	747.50	1	ERV-1
UH-23	E1. 724.00	10,500	20-WF	734.00	1.5	T-16	C-2	Office	6,300	SWG 32 "x6 "x32"	747.50	1	ERV-2
ŲĤ-24	Er. 724.00	10.500	20-WF	734.00	•1.5	T+17	C-3	Janitor Closet	3, 300	SWG 24"x4"x26"	747.00	1	ERV-3
UH-25	E1. 724.00	10,500	20-WF	734.00	1.5	T-17	C-4	Toilet & Locker Room	7,700	SWG 32"x6"x38"	747.50	1	ERV-4
UH-26	E1. 724.00	10,500	20-WF	734.00	1.5	T-18	C-5	Toilet & Locker Room	7,700	32 "x6" x 38 "	747.50	1	ERV-5
UH-27	E1. 724.00	10,500		734.00	1.5	T-18	C-6	Stairwell No. 3	16,200	SWG 38 "x8 "x62 "	748.00	2	ERV-6
UH-28	E1. 724.00	10,500	20-WF	734.00	1.5	T-19			· · · · · · · · · · · · · · · · · · ·				
UH-29	E1. 724.00	10,500	20-WF	734.00	1.5	T-19		•		,		, <i>d</i>	
UH-30 (	EI. 724.00	10,500	20-WF	734.00	1.5	T-20						: And an analysis of the second	

		)			THERMOSTA	T'SCHEI	DULE			ر میں میں میں میں میں میں میں میں میں میں	
UNIT NO.	LOCATION	UNIT CONTROLLED	ТҮРЕ	ACTION	RANGE	UNIT NO.	LOCATION	UNIT CONTROLLED	TYPE	ACTION	RANGE
T-1,	Storage Room	UH-I	Room	2-Pos.	56° to 84°	T-24	EI. 706.00	UH-36	Room	<i>2-Pos</i> .	56° to 84°
T-2	Screen Room	UH-2 & UH-3	Room	2-Pos.	56° to 84°	T-25	EI. 706.00	UH-37	Room	2-Pos.	56° to 84°
T-3	Screen Room	UH-4, UH-5 & UH-6	Room	2-Pos.	56° to 84°	T-26	EI, 706.00	UH-38	Room	2-Pos.	56° to 84°
T-4	Screen Room	UH-7 & UH-8	Room	2-Pos.	56° to 84°	T+27	EI. 694.00	UH-39	Room	2-Pos.	56° to 84°
<u>7</u> -5	Storage Room	UH-9 & UH-10	Room	2-Pos.	56° to 84°	1-28	EI. 694.00	UH-40	Room	2-Pos.	56° to 84°
T-6	Screen Room	UH-11 & UH-12	Room	2-Pos.	56° to 84°	1-29	EI. 694.00	UH-41 & UH-42	Room	2-Pos.	56° to 84°
T-7	Screen Room	UH+13 & UH-14	Room	2-Pos.	56° to 84°	7-30	EI. 694.00	UH-43 & UH-44	Room	2-Pos.	56° to 84°
<i>T-8</i>	Stairwell No. 1	ERV-1, C-1	Room	2-Pos.	56° to 84°	T,-31	EI. 694.00	UH-45 & UH-46	Room	2-Pos.	56° to 84°
T-9	Office	ERV-2, C-2	Room	2-Pos.	56° to 84°	T-32	EI. 694.00	UH-47 & UH-48	Room	2-Pos.	56° to 84°
(Î-10	Janitor Closet	ERV-3, C-3	Room	2-Pos.	56° to 84°	T-33	Motor Room	PRV-1 & PRV-2	Room	2-Pos.	70° to 140°
T-11	Toilet & Locker Room	ERV-4, C-4-8 ERV-5, C+5	Room	2-Pos.	56° to 84°	7-34	Motor Room	PRV-3 & PRV-4	Room	2-Pos.	70° to 140°
T-12:	Nator Room	UH-15 & UH-16	Room	2-Pos.	56° to 84°	7-35	Motor Room	AHU-1 WV-1 Heating Coil I	Remote	2-Pos.	15° to 90°
T-13	Notor Room	ÚH-17 & UH-18	Room	2-Pos.	56° to 84°	1-36	Motor Room	AHU-1 WV-2 Heating Coil 2	Remote	Mod.	56° to 84°
T-14	Motor Room	UH-19 & UH-20	Room	2-Pos.	56° to 84°	T+37	Motor Room	AHU-1 Freeze Protection	Remote	2-Pos.	0° ta 70°
rT-15	Motor Room	UH-21 & UH-22	Room	2-Pos.	56° to 84°	<b>I</b> -38	Screen Room	AHU-2 WV-3 Heating Coil I	Remote	2-Pos.	15° to 90°
T-16	E1. 7:24.00	UH-23	Room	2-Pos.	56° to 84°	7-39	Screen Room	AHU-2 WV-4 Heating Coil 2	Remote	Mod.	50° to 84%
T-17	E1. 724.00	UH-24 & UH-25	Room	2-Pos.	56° to 84°	T-40	Screen Room	AHU-2 Freeze Protection	Remote	2-Pos.	0° to 70°
T-18	E1. 724.00	UH-26 & UH-27	Room	2-Pos.)	56° to 84°	T-41	Stairwell No. 3	ERV-6, C-6	Room	2-Pos.	56° to 84°
T-19	E1. 724.00	UH-28 & UH+29	Room	2-Pos.	56° to 84°			ł.		, .	
T-20	E1. 724.00	UH-30 & UH-31	Room	2-Pos.	56° to 84						
T-21	EI. 724.00	UH-32 & UH-33	Room	2-Pos.	56° to 84°				the second		ţ
I-22	Not Used						· · · · · · · · · · · · · · · · · · ·				
1-23	E1. 706.00	UH-35	<sup>(</sup> Room	2-Pos.	56° to 84°	and and the second s	A Charles		, ) <b>(</b>		
			nentanyi ine panyasan anangkani ana ang ang ang ang ang ang ang ang ang	an dan sahari da uku karkar da cana karapatan, ini lahun sa Mandalar kar		anneam dalaitheac anna mailean a' agus ann an ann an ann ann ann ann ann ann	an an an ann an an an an an an an an an				and an a second and a second and a second provide a second s

بد		
	-	

	LOUVER SCHEDULE ·										
UNIT NO.	LOCATION	LOUVER SIZE	INTERLOCK DAMPER WITH	EL. TOP OF LOUVER							
L+1	Motor Room	96 <b>"</b> ×120"	· AHU-I	755.00							
L-2	Motor Room	48 <b>"</b> ×48 "	Backdraft Damper	750.00							
L-3	Motor Room	84"x120"	Top PRV-182 Bott.PRV-384	755.00							
L-4	Screen Room	48 "x 108 *	PRV-7	754,50							
L-5	Screen Room	48 "x 108 "*	AHU-2	754.50							
L-6	Screen Room	24"x48"	Automatic Air Relief	749.00							
L-7	Screen Room	24"x36"	F-3	747.50							
,	、	(									
	•	,									

\*Damper Size 48"x60" with Plenum from Louve size to suit.

		and a strategy and a		n de la compañía de l						
	VALVE SCHEDULE									
UNIT NO.	UNIT CONTROLLED	ТҮРЕ	FLOW G.P.M.	ACTION	CONTROL NO.					
WV-J	AHU-I Heating Coil I	Heating	70	2-Pos.	7-35					
WV-2	AHU-I Heating Coil 2	Heating	65	Mod.	T-36					
WV-3	AHU-2 Heating Coil I	Heating	20	2-Pos.	T-38					
WV-4	AHU-2 Heating Coil 2	Heating	18	Mod.	T - 39					
-		a na an								
1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -		8			· · ·					
ERV-1	C-1	Heating	1	2-Pos.	T-8					
ERV-2	C-2	Heating	1	2-Pos.	T-9					
ERV-3	C-3	Heating	1	2-Pos.	T-10					
ERV-4	C-4	Heating	1	2-Pos.	Τ-11					
ERV-5	C-5	Heating	1	2-Pos.	T-11					
ERV-6	C-6	Heating	2	2-Pos.	T-41					
					- On an Frank and a state of the second s					
-			n gang pang ng							
-	a na			996594599599999999999999999999999999999	a second and the seco					

![](_page_84_Figure_11.jpeg)

9	r	to	AHU -	2`

N 54

1

.

AIR HANDLING UNIT

AHU-I shall be Trane No. 25 vertical draw-thru climate changer with a capacity of 14,650 CFM @ 0.25" external static pressure. Unit shall have medium capacity filter box, I5HP fan motor, room for 2 hot water heating coils, controlled by T-37 and interlock with M.O. damper at  $L_7I$ . Heating coil No.1 to have a capacity to heat 14,650 C.F.M. of -10°F air to 34°F (696,170 Btu/Hr) when supplied with 70 G.P.M. of 200°F water, controlled by WV-1, T-35. Heating coil No. 2 to have a capacity to heat 14,650 C.F.M. of 34°F air to 72°F (601,250 Btu/Hr) when supplied with 65 G.P.M. of 200°F water, controlled by WV-2, T-36.

AHU-2 shall be Trane No.8 horizontal suspended torrivent with a capacity of 4,000 C.F.M. @ 0.25" external static pressure, Unit shall have flat filter box, 3HP fan motor, room for 2 hot water heating coils, controlled by T-40 and interlock with M.O. damper at L-5. Heating coil No. 1 to have a capacity to heat 4,000 C.F.M. of -10°F air to 34°F (190,080 Btu/Hr) when supplied with 20 G.P.M. of 200°F water, controlled by WV-3, T-38. Heating coil No. 2 to heat 4,000 C.F.M. of 34°F air to 72°F (164,160 Btu/Hr) when supplied with 18 G.P.M. of 200°F water, controlled by WV-4, T-39. .

### GRAVITY VENTILATOR

Penn Airette with 36"x12" throat for elevator machine room by Penn Ventilating Co.

*	POWER ROOF	ENTILATOR	AND FAN S	CHEDULE	
UNIT NO.	LOCATION	CFM & STATIC PRESSURE	PENN MODEL NO.	INTERLOCK UNIT WITH	CONTROL
PRV-1	Motor Room	4,675@0.25"	LC-28	Top Half L-3	1-33
PRV-2	Motor Room	4,675@0.25*	L <b>C</b> -28	Top Half L-3	1-33
PRV-3	Notor Room	4,675@0.25*	LC-28	Bott. Half L-3	T-34
PRV-4	Motor Room	4,675@0.25*	LC-28	Bott. Half L-3	1-34
PRV-5	Locker Room	250@0.25"	XT-94		Manual
PRV-6	Office	200@0.25 "	AW-10		Manual
PRV-7	Screen Room	8,300@0.25"	LC-42	L-4	Manual
F-1	EI. 706.00	14,650@0.50"	Peerless 365K	AHU-I	Manual
F-2'	Mechanical Room	600@0.25"	Peerless D8A		Manual
F-3	Screen Room	1,20000.25"	Peerless 105D	4-7	Mariual

•

![](_page_85_Figure_0.jpeg)

![](_page_86_Figure_0.jpeg)

![](_page_87_Figure_0.jpeg)

### NOTES

.

- I: Provide a 2" conduit through the floor slab under each MCC section. Cap both ends for future use.
- 2. Install and wire a red and green indicating light on each of compartments 3C and 3D. See Valve Schematic sheet 42.

.

II 250MCM 2 1/4 6 0 P5 (5) C3

Straight

![](_page_87_Figure_10.jpeg)

![](_page_87_Figure_12.jpeg)

![](_page_87_Figure_13.jpeg)

MICROFILMED

![](_page_88_Figure_0.jpeg)

•			1 1	1. 2010 - 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	n - ann ann ann ann ann ann an 1865 ann an 1867 ann an 1877 ann	ere governe an de la de la de la de la de	1.0		
An	hana in a sa	ş •		120/240	V.I Ph.3 Wire	PANEL	LZ	4	· · · · · · · · · · · · · · · · · · ·
1	WATTS	1		WATTS	NEUTRAL C		A	JGROUND	WATTS
	400			315	I Exit light El. 694.00 8 Fixtures Stair No.2	10	~ 2	6 Big Eye Emerg. Lt. 2 Exit Lt.	300
				615	5 Fixtures,3 Exit Signs St No.1 & No.2, 3 Fixtures El Room	airs levator <u>3</u>	44	15 Fixtures South Plan Floor E1.706.00	160
						5~		Some state in the second se	665
			VÅ	570	12 Fixtures South Plan Flo	por 1		9. Fixtures North & South	675
			<u>م</u> ار	570	Plan El.694.00	<u> </u>	10	11001 L1.724.00	500
	150		$\Lambda$	855	16 Fixtures South Floor A	lan <u>"</u> T	12		- - -
20	1260	4	<u> </u>	855	<i>F1.744.00</i>	13		3 Receptacies El.724.00 3 Receptacies El.694.00	1080
<u>م</u>	1000		~	1500		- <sup>15</sup> T-	16	6 Fixtures North End Floor Et 734.00	1500
20	760		4	1500	E1.744.00		18		1500
	1500			1500	3 Flood Lights North and L	EI. 734.00	20	8 Fixtures South Plan Floor El 694.00	760
	1080	4 18 C 3.		300	Light & Recep. Elevator P	······································	22	Зраге Д	
ain	650			540	3 Receptacles, North End. E1.724.00, 7 <b>34</b> .00	Floor 23	24	8 Recpl. El: 144: 00, 734:00	1440
				950	3 Fixtures, Office, El. 14 4 Fixt Lacker Room El. 744.	4.00 25	26	A Receptacles Office West End E1.744.00	120
				900	5 Receptacies Locker Room End El.744.00	n West 27	28	Magnefic Coupling panel (RSP-)	3
	700			1500	Water heater	<sup>29</sup>	30		
			r i			<u> </u>	32		
						33~		HCLU-2	
•				9'50	10 Fixtures Mechanical R	00m 35	<u> </u>	Test Power	
				720	4 Recp. Mechanical Room	37,	38	Convector Radiator Valves ERV-1 thru ERV-6	300
						39	40	15KV Swar 2 Outdoor Units	
	r. E					410	42	, one ongr. 2 ourdoor onris	

- 19 🖉 19 🖓 - 19 - 19 🔨

1.090

A nonga is

Aurent

and the set

THATHS THERE AN

Notes: I.) All items not specifically located by a notation shall be in the motor control center or starter enclosure.

° 4 °

CONFORMED TO CONSTRUCTION RECORDIN 11-9-77 WID AUP

D'HI-I

SHEEP 420F 50

D-1322.02

KANSAS CITY, MISSOURI POLLUTION CONTROL DEPARTMENT BIRMINGHAM PUMPING STATION ELECTRICAL SCHEMATICS P.C.D. CONTRACT

BLACK & VEATCH CONSULTING ENGINEERS, KANSAS CITY, MO. DESIGNED DAC, SLC, OML CHECKED BOR DETAILED JMC RTB APPROVED BORGECCUS DATE S/14/14

MICROFILMED

W.J.D.

والخان فسيستنقص فالتحاصي فالشاه

![](_page_89_Figure_0.jpeg)

 $|\mathbf{x}| = \mathbf{y}_{1}$ 

D-1322.02

and the second s

![](_page_90_Figure_0.jpeg)

![](_page_90_Figure_2.jpeg)

![](_page_91_Figure_0.jpeg)

![](_page_91_Figure_1.jpeg)

![](_page_91_Figure_2.jpeg)

![](_page_92_Figure_0.jpeg)

![](_page_93_Figure_0.jpeg)

)

![](_page_93_Figure_5.jpeg)

![](_page_94_Figure_0.jpeg)

## A 11.8.77

Revised

٠.,

![](_page_95_Figure_0.jpeg)

And Providence

			ананананананананананананананананананан			ngan nasar na nas na	per eta la grada e concerción E
			IA Fan-1 IB	2A 2AA Boiler Spare 2B	3A Fan-3 3B HVI		
			PRY-7 IC AHU-1 ID AHU-2 IE	Spara 2C PRV-1 2D PRV-2 2E PRV-3	Hain Breaker 3C Lighting Panel HVL 3D Hot Water Pump I		
W Tter*	· · ·		Main Breaker MOTOR CONTROL Enclosure NEMA Type I In ANSI-61 Light Arrangement Single Face,	2F PRV-4 <u>CENTER HY</u> ndoor Gasketed Gray Front Only, Mo	3E Hot Water Pump 2 Doors unting Units		ERV (T+1) $ERV (T+1)$ $ERV (T+1)$ $ERV (T+1)$ $ERV (T+1)$ $ERV (T+3)$
Louvre L-I *Spare Size 2 Sta	"Spare"	م م م م م	Straight Not Accessibl Rear Removabl Main Bus at T Incoming Feed Outgoing Feed Control Wirin Ground Bus Characteristi 480 Volt, 3 P Incoming Feed Ground Bus Ca Main Bus Rati Bus Bracing A Wiring NEMA C	e from Rear e Plates op er Enters Top g Enters Top & CS hase, 60 Hertz ler Cable Size oble Size 2 AWG ng 600 Amp. t 22,000 Amper lass 2, Type D	& Bottom & Bottom Bottom 250 MCM/Phase 5. re Symmetrical 3		Convectors Cl thru G6
H-2 H-1 H-1 H-1 H-1 H-1 H-1 H-1 H-1 H-1 H-1	$ \begin{array}{c} UH \\ G \\ UH \\ -H \\ -T \\ -H \\ -T	$\begin{array}{c} UH-\\ 20\\ 17\\ 14\\ 19\\ 14\\ 14\\ 14\\ 14\\ 13\\ 13\\ 13\\ 13\\ 14\\ 10\\ 13\\ 13\\ 13\\ 13\\ 13\\ 13\\ 13\\ 13\\ 13\\ 13$	$\begin{array}{c} UH-\\ H\\ IG\\ UH-\\ IS\\ UH-\\ IS\\ UH-\\ IS\\ UH-\\ IS\\ UH-\\ IT\\ IT\\ IT\\ IT\\ IT\\ IT\\ IT\\ IT\\ IT\\ IT$	$ \begin{array}{c} UH \\ 21 \\ 11 \\ 21 \\ 11 \\ 12 \\ 11 \\ 22 \\ 11 \\ 22 \\ 11 \\ 25 \\ 11 \\ 25 \\ 11 \\ 25 \\ 11 \\ 25 \\ 11 \\ 26 \\ 11 \\ 11 \\ 26 \\ 11 \\ 11 \\ 11 \\ 26 \\ 11 \\ 11 \\ 11 \\ 11 \\ 11 \\ 11 \\ 11 \\ 1$	$ \begin{array}{c} UH \\ 23 \\ -UH \\ -23 \\ -UH \\ -38 \\ -122 \\ -UH \\ -37 \\ -37 \\ -725 \\ -UH \\ -36 \\ -724 \\ -35 \\ -723 \\ -$	UH- 43 1-30 UH- 44 1-30 UH- 42 1-30 1-3	$ \begin{array}{c} UH \\ 45 \\ UH \\ 46 \\ UH \\ 46 \\ UH \\ 46 \\ UH \\ 47 \\ 48 \\ UH $
14. O	ers 84.0 IVL	ers 84.0 & 744.0 14L	ers 44.0 ers 24.0	HVL ers 0 & 724.0	HVL ers 06.0 & 744.0	ан. ers 3a. & El.694.0	ave ters 4.0

LIGHTING FIXEURE SCHEDULE STYADU LAMP MIG. HOF. Differences and the second Grid (1200) Hologham Co. Styce 1200 Fixeure and Table Schedules and the second Grid (1200) Hologham Co. Styce 1200 Fixeure and Table Schedules Control Law Might Schedules and the second Grid (1200) Hologham Co. Styce 1200 Fixeure and Table Schedules Control Law Might Schedules and the second Grid (1200) Hologham Mol. Styce 1200 Fixeure and Table Schedules Control Law Might Schedules and the second Grid (1200) Hologham Mol. Styce 1200 Fixeure and Table Schedules Control Law Might Schedules and the second Grid (1200) Hologham Mol. Styce 1200 Fixeure and Table Schedules and	E C C C C C C C C
SYMBOL       LAMP       HIG.       TYPE       MAUPACTURER       FIXTURE         C.       BSTGFIAD       Recessed       First River (is) Acrylia       Statutes and Recessed       First River (is) Acrylia       Statutes and Recessed       Statutes and Rec	C C C C C C C C C C C C C C
Image: Second	C C C C C C C C C C C C C C
Image: State of the state	Efuso S S S S C S M S C S M S C S S C S S C S S C S S S C S S S C S S S C S S S C S S S C S S S C S S S C S S S C S S S C S S S S C S S S S S S S S S S S S S
Instructure       Instructure       Instructure       Instructure       Instructure         Image: Instructure       Instructure       Instructure       Instructure       Instructure         Image: Instructure       Instructure       Instructure       Instructure       Instructure         Image: Instructure       Instructure       Instructure       Instructure       Instructure       Instructure         Image: Instructure	Fluso Fluso Soz Soz Soz Soz C
An advert       calling       calling <td>Efuso Efuso \$3 \$2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$</td>	Efuso Efuso \$3 \$2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
22       CM/1204: Indiang       Linding       Ling. Feature       Linding       Ling. Feature       Ling.	Eluso Eluso \$3 \$2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Image: Second	Eluso Eluso \$3 \$2 \$3 \$2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Image: Solid and Solid an	Flush Flush \$3 \$2 \$2 \$ \$ \$ W \$ W
AL       Hadid-124       Floor       artached Heads + 120*       Hu-15-2-Adid-120         EXIT       1/20V       Sign Lensate, Single-Rided       Holophane Co.       Holophane Co.         EXIT       1/20V       Sign Lensate, Single-Rided       Holophane Co.       Holophane Co.         MS/CM 120V       Image: Construction of the consthe construction of the construction of the construction of the co	Fjush \$3 \$2 \$ \$ \$ \$ W \$ W
EXIT       11 F20112 in mail       Security Linghting 1200       84.22-120         Image: Security Linghting 1200       100 Linghting 1200       84.22-120         Image: Security Linghting 1200       100 Linghting 1200       84.22-120         Image: Security Linghting 1200       100 Linghting 1200       84.22-140         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200       100 Linghting 1200       100 Linghting 1200         Image: Security Linghting 1200 <t< td=""><td>Flush \$3 \$2 \$2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$</td></t<>	Flush \$3 \$2 \$2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Image: State of the state	\$3 \$2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
EXITA       4-1733       on       while structure of the structure	₽² Â \$w ⊕w
(2)       H1000X38-4       on       Cailing       Early 1/20/2000       Early 1/20/2000         (0)(M/120V)       cailing       Early 1/20/2000       Early 1/20/2000       Early 1/20/2000       Early 1/20/2000         (1)(0)(M/120V)       (cailing)       Early 1/20/2000       Early 1/20/2000       Early 1/20/2000       Holophane Co. 1%         (1)(1)(1)(1)(1)(1)(1)(1)(1)(1)(1)(1)(1)(	∠1\ \ \$₩ €
$\begin{array}{c} \begin{array}{c} \begin{array}{c} 1 & 0^{-} 3bove \\ 1 & 1amp3 \\ \hline 1amp3 \\$	\$₩ €.
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	e,
Image: High Constraints       Parts Flood light.Heavy-duty General Electirc Weating proof. #Trunnion mount #C5246006         Image: High Constraints       Image: High Constraints         Image: High Constraints       Poil & Sama W3 lipfilter G.E., No. General Electric SAME         Image: High Constraints       Poil & Sama W3 lipfilter G.E., No. General Electric SAME         Image: High Constraints       Poil & Sama W3 lipfilter G.E., No. General Electric SAME         Image: High Constraints       Poil & Sama W3 lipfilter G.E., No. General Electric SAME         Image: High Constraints       Mounted Mount.G.E. No. 35-96472005         Image: High Constraints       Mounted Mount.G.E. No. 35-96472005         Image: High Constraints       Mounted Mercury w/P.E. Control         Image: High Constraints       Mounted Acrylic Globe 1204         Image: High Constr	
+(2)H       050073/CL:       Pold       Sama W/3 lipfitter G. E. No. 33-110728-03 & Trunnion       General Electric       SAME         120V       EL. 140.00 Pold       Wount G. E. No. 35-964720:05       #C5246006       SAME         Nextury       Wolf Mercury W/P.E. Control       General Electric       SAME         Nextury       H2500X37-5       Wounted Mounted Bounted EL. 756.92       WL-100 Wallighter with Acrylic Globa 120V       General Electric         (1) H       138JA-100/ EL. 756.92       EL. 756.92       WL-100 Wallighter with Acrilic Refractor       General Electric         (1) H       DX. 120 V       Acrilic Refractor       # C751G101-120       EL	· · · · ·
PEQ H250DX37-5 ELT34.08 H250DX37-5 ELT34.08 H38JA-100 ELT34.08 Mercury w/P.E. Control Acrylic Globa 120v Control Acrylic Globa 120v General Electric Acrilic Refractor Control Contro Control Control Control Control Control Control Control	
138 JA-109 El. 756.92 WL-100 Wallighter with General Electric Acrillic Refractor Acrillic Refractor Acr	
	40
	t
	j∉ j;++
	¥
	• • • • •
G.E. N <sup>2</sup> M22 Box, Duplex'	terstop weld conduits —
resistant cover	ound -
conduit	3
14'-0" Steel Galvanized Pole, including Anchor	losed ties 🛩
Woll	reinforcing
not shim ¢ 1 grout	shown;
3/4" 0100 0 0 Conduit 0 0 0 0 D. 10 0 0 0 D. 10 0 0 D. 10 0 0 D. 10 0 0	CON

in 1

6) 5

l'a' l

\* J.

A start

690 is 100

111

WIRIN	G INSTALLATION LEGEND Conduit underground	ONE -	INE DIAGRAM LEGEND	¥		t Animary & Socondary Voltag
	Conduit exposed	-	$\frac{480V}{2.4KV}$	and K	A rating	primary & Secondary Turiag
an anti-analysis	Conduit concealed at floor & wall	Co-	22: 3#8,#100,2"	Circui 1#10 1	i No.22, wi	th 3#8 Insulated conductor wire all in 2" conduit to
	Conduit turning up. Conduit turning down.		-14 IA	20 HP	motor as indicate	d'in HP or KW are expected
<u>o</u>	Conduit continuing up, down, or through Conduit plugged flush, Conduit capped	(HP)-	22:3 <sup>#</sup> 8, <sup>#</sup> /0G,2"		as murcare ay yary with nont has lay	the equipment furnished.
<u> </u>	Shows projected space for many conduits			and a	lectrical ed	uipment shall be enlarged
na kan kang pangan an mang kang pangang	routed in same general path Short dash for each phase conductor. Long dash	KW	Augultions itom may not	requir	cų.	х х
and sold stade and the	for neutral conductor. Circular dash for around wire.	$\bigcirc$	be shown	One-I	ine showing	power & control to a packa
2-5	Typical for home run to be routed to lighting			ynit. Air Co	as for example onditioning	Unit, shall imply that any
Ň	Lighting fixture. Refer to number or letter	15 -		and a insta	ll associate lled and wi	ed equipment shall also be red as required by the
2	in hixture schedule.			equip	ment turnisi	nea.
	Flugrescent fixture		۰ ۲			
	Half arrow-head indicates more than one home run on single circuit		<u>A_</u>	Indic route	atés that a d in duct b	ll or part of circuit may L ank or underground. May no
face		•	<b>○</b>	be us	ed for obvi	ous underground circuits.
Š	Single Pole Switch			<u>H</u> igh	Voltage Dra	wout Air Eircuit Breaker
) <u>)</u>	Three Way Switch Two Pole Switch		3P-20	Law V	oltage Air	Circuit Breaker, 3 pole 20
] [4	· - ·			Amper	G	· ·
			<u></u>	Size	4 Combinati	on Mågnetic motor starter
×	Weathernroaf Switch			` Hiah	Voltage Bra	wout Fused Notor Starter
<b>)</b> W	realine proof an inc.					
₽,	Duplex Receptacia 120 Volt			Fuse	& Disconned	t Switch
Ð	Clock Receptacle	2010 - 1945 - 1945 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 -	521-1-1	Size	2 Magnetic	Notor Starter, Reversing o
d	Twistlock Receptacle for Emergency Light Units.*	,		Two 3	speed	
<b>M</b> -	180V,30 Welding Receptacle, Typical Ampere 🗡		ج			``
	Tatephone Outlet	• .	•			
	Normally closed contact (NC)	ABBR	EVIATIONS			
	Normakly onen contact (NO)	AIL	Amber Indigating Light		KI	- Key Interlock
<b></b>		ANÌ AS	Ammeter Switch	, (	K¥ K₩	Kilovalt Kilowatt
. · ·		AWG AHU-I/	American Wike Gage Air Handling Unit #1		KVA	Kilovolt Ampere
		Aux Auto	Auxiliary Automatic		LA	Lightning Arrester Level Indicator
		AL AC	Alternating Current		LOR	Local-Off-Remote Low Pressure Switch
		Bsmt	Basement }		LWCO	Low Water Cutoff Louvre
		- C ·	Close Coil or Contacts		M	Magnetic Motor Starter
		CB CP	Circuit Breaker Control Panel		MH MS	Manhole Manual Motor Starter
۲	: -	CS · CT	Control Station Cycle Timer, or Current Trans	former	NCC NCM	Motor Control Center Thousand Circular Mil
. 1		CTm CTc	Cycle Timer Motor Cycle Timer Clutch		m A M V	Milliampere Mercury Vapor
		2/6 3-61	2 Conductor (Typ) 3 Current Transformers (Typ)		Mfr Min	Manutacturer Minimum or Minute
•		4°¢ CPT	4, Conduit (Typ) Control Power Transformer		Mita MitH	Mountea Mounting Height
•	and the second se	Cap Ckt	Capacitor Circuit Calling		MCV	Nadulating Current Valve Nametic Coupling
à	f	Cigi DM	Damper Watar		NC NO	Normally Closed Normally Open
<u>)</u>		ĎĨ DPS	Door Interlock Differential Pressure Switch		Nd NEC	, Number National Electrical Code
		DVLS Dwg	Discharge Valve Limit Switch Drawing		NTS Neut	Not To Scale Neutral
; A		Ditt EFP	Differential Extraneous Flow Pump	2	0	0
	top and sides calk	ÉRV ETM	Electric Radiator Valve Elapsed Time Meter	,	, OL	Overload Overload Over Tomporature Cutout
	with Thiokal	E I EP	Elevation Explosion Proof		2P	2 Pole (Typ)
		F FS	Fan Float Switch		PB P/B	Push Button Pull Box
		Fut GIL	Future Green Indicating Light		P/I PS	Pressure to Current Xdcr Pressure Switch
		#8G CLS	#3 Ground Wire Geared Limit Switch	٩	P1 3-P1	Program Timer or Potenti 3 Potential Transformers
	21	Gnd	Ground Hat Circuit		PSI PRV-2	Pounds Per Square Inch Power Roof Ventilator #2
0		HP	Horsepower Hand-Off+Auto	ł	Pn1 Po <b>s</b>	Panal Position
T		Hz	Hertz (Cycle) Heating		Pras. PE DH	Pressure Photo Electric Cell Red Indicating Light
		Htr HWP	Heater Hot Water Pump		RT RT RSD	Repeating Timer Raw Sawage Pumn
T	1 13#5,8"	····	Indicator		RTŞ RR	Remote Temperature Selec Ratchet Relay
1		Intlk	Interlock		. • <b></b>	
TATIO	1KU PUMPING	<b>. .</b>	Junction Box			۲۰۰۰ میں
TYP	ICAL					1
(No	Scale) Notes: I. Rainforcing shown is typical	i.			•	, , , , , , , , , , , , , , , , , , ,
	fon each bracket 2 Width of bracket shall not be	<b>'</b> (		)	-	(1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,
	a second struct y a grade of and hand of the	*	۰. ۲			*

11-8-77 Revised

tr

![](_page_96_Figure_5.jpeg)

Port States and the south of the local the south the south of the southoe south of the southoe south of the south of the south of the s

A Land

![](_page_97_Picture_0.jpeg)

![](_page_97_Picture_1.jpeg)

MISSOURI

CITY OF FOUNTAINS

Project Number 81000928

Project Title Birmingham Pump Station Screen Replacement

### ISSUE DATE: July 1, 2022

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on <u>July 12<sup>th</sup> 2022</u>, are amended as follows:

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

- 1. All Contractors desiring to see the inside of the wet well are invited to schedule a site visit on Wednesday, July 6th, 2022 between 11am-4pm. Site visits are to be scheduled with David Elge at Phone: 816-209-8850 or Email: David.Elge@kcmo.org. Wet well visits for contractors that have already had a site visit will be scheduled for 30-minute blocks on a "first-come-first-serve" basis. Site visits for contractors that have not had a site visit will be scheduled for a one-hour block including viewing of the wet well. Contractors are required to bring hard hat, rubber boots, flashlight, and a portable 4 gas monitor.
- 2. Bidder questions and responses are included below. Additional questions will be answered in an Addendum Number 5, anticipated next week.

Q1.	Are manufacturers required to meet MBE/WBE requirements?
A1.	The MBE/WBE goals are for the overall Contractor contract. A manufacturer is not required to meet MBE/WBE requirements for equipment. All manufacturer equipment should be provided through the Contractor contract. City desires that MBEs/WBEs have a maximum opportunity to participate in the performance of City contracts.
Q2.	The existing Vulcan screens have recessed slots in the concrete walls in which the frames were set in place. The drawings indicate that the new Duperon screens are anchored into a flat surface inside the channels. Please confirm that contractor will have to form and fill the existing recessed slots from the channel floor all the way up to the operating level. If so, please provide a detail showing the required reinforcement that is to be provided in these channel slots.
A2.	If it is necessary for installation of any screen manufacturer to fill the recessed slots in the concrete walls, this should be included in the manufacturer's instructions and the contractor pricing.
	This was addressed in a change in Addendum #3: Specification 11330. Paragraph 1.01.C. Delete and Replace with the following: "Each screen shall be furnished complete with bar rack, dead plate, discharge chute, side frames, covers, rake blades, drive chains, sprockets and bearings, scraper assembly, drive motor, gear reducer, anchor bolts, controls and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation. <u>Modifications to channels necessary to install each screen shall be</u> <u>included in manufacturer installation instructions</u> . Details of any required grouting or seal between the screen and the side walls of the channel shall be included in manufacturer

	installation instructions. The Contractor is responsible for costs and procedures required for channel modifications required for installation of the screens including any grout work
	necessary to fill gaps in the side channels for screen installation."
Q3.	Contractor is requesting that the attached Warren Environmental single-coat epoxy system (301-14) be considered as an acceptable alternate to the four-part Tnemec coating system that is specified in section 09960 for the concrete substrates. This substitution is being submitted in accordance with section 01630. We see this as a viable and effective solution to address the current state of the existing wet wells and channels for years to come.
A3.	Warren Environmental single-coat epoxy system (301-14) is accepted as an approved equal, and shall be applied at 500 mils. See changes to specification below.
04	Will the summer he able to stop all influent flow to the influent structure?
Q4. A4	Contractor is responsible for bypass of flow during construction. There is no ability to stop all
<b>/ 1 7 .</b>	influent flow to the influent structure.
05	Use long is the 120" give from the shutoff gaint? (Use groups will the contractor have
Q5.	to pump out?).
A5.	Contractor will not be able to stop flow from the 120" interceptor. Flow will need to be
	bypassed during shutdowns.
06	What is the size of the other 3 lines that are coming into the influent structure, these are not
<b>Q</b> 0.	shown on the plans? How much flow comes through these lines? We noticed pumps set up to divert this flow for 2 of the lines at the walk thru.
A6.	The sizes of the lines coming into the influent structure according to the City are 48" on west; 120" in north, 60" on the east. As stated in Addendum #3: "There is no flow monitoring at the Pump Station. Peak flows at the Pump Station are indicated to currently be greater than 20 MGD. The hydraulic capacity of the Pump Station is designed to match the hydraulic capacity of the downstream WWTP of 32.5 MGD." The pumps mentioned are only to pump around the flap gates, and are not available for bypass pumping of the structures.
07	
Q7.	For the new Section 13855, are contractors to just bid the equipment and no chemical?
A7.	sentence. This section is further modified below to terminate the piping at the influent structure and add heat tracing.
08	Dian sheet D.000. Turical Full Donth Asphalt Daysment detail contains the note, "ADM/A Turo 2
Q8.	01 Asphaltic Concrete Surface Course (Match Existing Pavement Thickness)." Without any geotechnical information, there is no way for the Bidders to know the existing pavement thickness. Please specify a pavement thickness that all the prospective Bidders shall include within their base bid pricing proposal.
A8.	Refer to Addendum #3:, Answer No 3: "Existing pavement cross section includes 2" asphaltic surface course, 6" asphaltic concrete base, and compacted subgrade as shown on Sheet 33 of 50 of the as-built drawings."
Q9.	Please provide the prospective Bidders with the As-Built drawings for the Birmingham Pump Station facility.
A9.	As-Builts were provided as an attachment to Addendum #3.

#### Specifications:

- 1. Section 09960. Paragraph 3.05.A. Delete and Replace as follows:
  - "A. Concrete Substrates, Vertical Surfaces:
    - 1. Wastewater Channels & Wet Well (vertical and horizontal surfaces):
      - a. Tnemic
        - i. Repair Mortar: Tnemec Series 217 at 1/4 inch to 2 inches DFT.
        - ii. Resurfacer: Tnemec Series 218 at 1/16 inch to 1/2 inch DFT.
        - iii. Intermediate Coat: Tnemec Series 434 at 1/8 inch to 125 mils DFT.
        - iv. Topcoat: Tnemec Series 435 at 15 to 20 mils DFT.
      - b. Warren Environmental single-coat epoxy system (301-14) at 500 mils."
- 2. Section 13855. Paragraph 1.01.A. Delete and Replace with the following: "This section includes the fabrication, delivery, installation, and placement into successful operation of a chemical feed system complete with a control system. This system will be complete and include chemical feed pumps, feed controls, liquid storage tank, and all piping and appurtenances required to feed chemical for odor control into the influent structure. The system shall include heat tracing or other technology to prevent freezing where necessary. One full load of Bioxide will be provided to facilitate start-up and system optimization. All materials shall be provided in accordance with these specifications."
- 3. Section 13855. Paragraph 1.03. First Paragraph. Delete and Replace with the following: "The system shall provide for bulk storage of chemical for odor control and metering of the chemical from the bulk storage tank to the influent structure. The system shall contain controls as necessary to facilitate single discrete dosing profile (24 hour setpoints) that varies in 1-hour increments in a stepping fashion over a 24-hr period. A calibration cylinder shall be permanently installed to facilitate calibration of feed pumps. The feed system is capable of reducing chemical usage by at least 10% versus typical 2-timer systems by dosing more closely to the demand curve."

#### Drawings:

1. Sheet M-104. Delete and Replace in its entirety. Changes are bubbled to show updates for water line to the mechanical Odor Control System and the Eyewash/Shower Station.

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

![](_page_100_Figure_0.jpeg)

![](_page_101_Picture_0.jpeg)

### ADDENDUM NUMBER <u>5</u>

Project Number 81000928

Project Title Birmingham Pump Station Screen Replacement

ISSUE DATE: July 5, 2022

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on <u>July 12<sup>th</sup> 2022</u>, are amended as follows:

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

1. The wet well viewing anticipated in Addendum #4 for Wednesday, July 6<sup>th</sup> is canceled and will not be rescheduled. Contractors with site visits for the rest of the site on that date will still take place.

![](_page_103_Picture_0.jpeg)

MISSOURI

### ADDENDUM NUMBER <u>6</u>

Project Number<u>81000928</u> Project Title <u>Birmingham Pump Station Screen Replacement</u>

### ISSUE DATE: <u>July 7, 2022</u>

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on <u>July 12, 2022</u>, are amended as follows:

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

Due to the desire to limit the number of individuals in City Hall, we would like to communicate the option to attend the Public Bid Opening virtually for July 12, 2022.

- 1. We will allow Bidders to submit their bids at City Hall-1<sup>st</sup> Floor Rm. 102W by the 2:00 PM deadline mentioned in the Invitation for Bid.
- 2. We are offering a virtual meeting via the link and information for Microsoft Teams. The Bid Reading will be "Live" through any computer, tablet or mobile device using the provided link. You can also choose to call-in using the number provided as well.
- 3. The Bid Results will be posted to the KCMO Planroom like our normal process.

### Microsoft Teams meeting

Join on your computer or mobile app Click here to join the meeting Or join by entering a meeting ID Meeting ID: 234 027 279 330 Passcode: H6KP7E Or call in (audio only) +1 872-212-5076,857960253# United States, Chicago Phone Conference ID: 857 960 253# Find a local number | Reset PIN Learn More | Meeting options

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

![](_page_104_Picture_0.jpeg)

KANSAS CITY MISSOURI

### ADDENDUM NUMBER <u>7</u>

Project Number 81000928

Project Title Birmingham Pump Station Screen Replacement

### ISSUE DATE: July 8, 2022

The Bid date for this Project stated in Form 00130 - Invitation to Bid and Form 00210 – Instructions To Bidders shall be changed to: 2:00 PM, on <u>July 19<sup>th</sup> 2022</u>.

Bidders are hereby notified that the Bidding and Contract Documents for the above project are amended as follows:

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

- 1. As stated below, the City has determined that the City will be responsible for cleaning of built up materials at the pump station and disposal of related debris prior to contractor activities. After an area has been turned over to the Contractor, the Contractor remains responsible for dewatering and disposal of the remaining residue.
- 2. Bidder questions to date and responses are included below:

Q1.	Cast-in-place concrete note 3 on sheet S100 calls for a 5,000 PSI mix; section 03300 2.03 E.7 calls for
	Class A mix which is 4,500 PSI. Please clarify what will be required for this job.
A1.	As answered in Addendum #3, Question #4: Follow drawing note 3 which calls out 5000 psi.
	Specification 3300 2.03.E Table A is modified in the specification changes below.
	Specification 3300 2.03.E.Table A. Modify Class A concrete to show the Minimum Specified
	Compressive Strength f'c at 28 Days (Pounds per Square Inch) to equal 5,000.
Q2.	Detail 10-S106 directs us to sawcut a straight edge, remove existing concrete and vertical rebar, and
	then epoxy grout fill. Does this detail apply to the existing CMU walls that get removed or just the new
	OH door opening?
A2.	For CMU walls use Detail 10A for slab and walls.
Q3.	Currently, the bid form does not allow for the Bidder to submit a unit price nor does it require the
	Bidder to include a stated allowance amount to cover the cost of dewatering, trash and debris removal,
	and disinfecting of the existing influent structure, pump station, or individual process units. If the City
	has previously contracted the dewatering, trash and debris removal, and disinfecting of the existing
	influent structure, pump station, or individual process units in the past, there could be sufficient
	information to calculate a stipulated allowance amount for the prospective Bidders to include within
	their complete pricing proposal. Please provide further clarification that the dewatering, trash and
	debris removal, and disinfecting of the existing influent structure, pump station, or individual process
	units scope of work will either be removed from the contract and completed by the City, outside of this
	contract, or provide a stipulated allowance amount for the prospective Bidders to include within their
	complete pricing proposal.
A3.	The City has determined that the City will be responsible for trash and debris removal of existing influent

	structure, channels, mezzanine level, east wet well, and west wet well. After the Contractor takes control of the area, the Contractor remains responsible for dewatering and disposal of the remaining residue. It is not anticipated that disinfection is needed and is not called for in the design. Modifications to specifications are included below. This response supersedes previous Addenda responses on this issue.
	Contractor may assume that the influent structure will require 1 week to clean, the five channels will require a total of 2 weeks to clean, and each side of the wet well will require 2 weeks each.
Q4.	At the existing wall penetrations for the makeup air ductwork there are plan sheet notes for the Contractor to patch and match the existing building exterior skin/siding. Please provide further clarification as to whether these are insulated panels and what gauge metal will be required to be installed?
A4.	Contractor is to submit a standard product that matches the existing surface contour and color. A custom patch is not desired. The panels are assumed to be insulated. The metal gauge is not known; if a submittal is made on a standard product from a reputable wall panel manufacturer, it will be acceptable to the engineer.
Q5.	<ul> <li>Section 09960. Paragraph 3.05.A.1. States Wastewater Channels and Wetwell.</li> <li>a. Do both the East and West Wet Wells get the concrete containment coatings system I assume?</li> <li>b. Since it is not called out specifically, we are assuming that the Influent Structure does not get coated.</li> </ul>
A5.	<ul> <li>a. Yes – both east and wet wells are to be coated. Clarification is included in the specification modification below.</li> <li>b. The influent structure does not get coated.</li> </ul>
Q6.	Section 09960. Paragraph 3.05.A.1.a. Show Tnemec Series 217 @ ¼ to 2 inches DFT. Since we typically only use repair mortar on existing concrete surfaces that are damaged or large voids greater than 1/8" deep, how can we bid that without knowing the extent of the damage or condition of the existing concrete?
A6.	There is no mortar repair anticipated at this time and none is shown on the drawings. This specification is included in the event that mortar repair is encountered, and will be addressed if needed during construction. The City has not reported any deterioration of concrete surfaces. Use of Tenemic Series 217 at ¼ to 2 inches DFT or equal is not expected to be included in the bid.
Q7.	Scale on sheet E103 may be incorrect. Other pages had been addressed in the addendums but no one mentions sheet E103.
A7.	The scale is identified as 1/32" equals 1'-0". The correct scale is 1/64" equals 1'-0". Sheet E103 is updated in the changes below.
Q8.	Sheet SD100 detail 2 shows the existing L3x3 angle that is in place for the existing removable slabs. Please confirm if this angle is to be left in place and re-used for the new removable panels, or if the contractor is supposed to demo the existing angle and replace with new angle to be poured in its place.
<b>A8.</b>	Contractor should assume the angle can be used in place.
Q9.	Please clarify Q&A #4 on addendum #4. The answer states that flow cannot be shut down. Specification Section 01110.01 3.01,A,3,b States that flow can be blocked for 6hrs. How is the contractor to setup diversion safely if flow cannot be shut down?
A9.	Specification Section 01110.01 Paragraph 3.01.A.3.b is modified below.
	Diversions and bypasses have been set up safely in the wet well and influent structure in past projects.

	<ul> <li>The City provides the following additional information for consideration in shutdowns:</li> <li>There is a gate located on the 120" interceptor approximately 0.25 miles upstream of the influent structure. This gate and gate operator may require rehabilitation by Contractor in order to operate. This gate can be used to block flow, but Contractor should not expect this to be watertight or stop flow to the influent structure.</li> <li>The remaining two lines have flap gates that may be utilized by the Contractor.</li> <li>Contractor may utilize the two (2) on-site 6" Godwin pumps during dry weather conditions. Contractor shall return the pumps to their current configuration when requested by the City due to the risk of wet weather flows within 24 hours. This answer supersedes previous answers provided in Addendum #4, A6 last sentence.</li> <li>A report including information about historical flows at the station is attached for your information. The report is not to be considered representative of future flows. This report does not supersede the General Conditions on Weather.</li> </ul>
Q10.	Regarding Addendum #4, Question 6, which includes the following question: "What is the size of the other 3 lines that are coming into the influent structure, these are not shown on the plans?"
A10.	Further clarification from Addendum #4 is included below. The City's GIS shows Active 48" RCP coming from west, 120" RCP active from the north, and 60" RCP active coming from east. The City GIS also shows a 20" DIP pipe that has been abandoned, and the 36" forcemain discharging from the Pump Station . Below is a screen shot from the City's GIS system.
Q11.	Drawing E- 201 shows (2) Radar Level Transmitters in the Wet Well and (1) Ultrasonic Level Transmitter in the Influent Structure. I see the Ultrasonic Level in the Specifications but not the Radar Level. Are the Radar Level's part of the project? The bid sheets also do not show the Radar Levels.
A11.	Radar Level Transmitters are part of the project. Modification to drawing notes included below regarding specification.
Q12.	I know KCMO will do the new PLC Programming according to specs. I don't see information on 'Systems Integration' Are Panels to be built and supplied or just control components to be added to existing enclosures.
A12.	Panels are to be supplied and built. A new enclosure and new equipment is being added. See revised E- 103 below and attached. See modifications to Section 15928, Paragraph 1.01 A & B below regarding Systems Integration.
Q13.	Where is BIM required on this project?
A13.	The scope for BIM has been assigned under the Design Professional contract.
Q14.	Where is asbestos removal anticipated?

A14.	There are no existing reports identifying hazardous materials or asbestos containing materials at the project site. Due to the age of the facility, asbestos removal cannot be ruled out, but it is not anticipated at this time.
015	
Q15.	Where is traffic control required?
A15.	l'raffic control is not anticipated on this project.
016	Where is preside control required?
Q10.	Where is erosion control required?
A10.	Erosion control is anticipated with the work needed to complete the new drive on the east side of the
	building.
017.	What is the extent of the existing duct removal?
A17.	The extent of existing duct removal is shown on Drawing DM-204 showing the demolition of existing
	duct around MAU-3. Drawing M-203 shows MAU-5 which penetrates the building through existing
	louver; there is a note explaining what needs to be removed and filled in.
Q18.	How do you anticipate performing a water tightness test on the new concrete?
A18.	It is anticipated that Contractor will close gates before and after the channels. City will supply water for
	the test. Contractor is to submit a testing plan as required in Section 01480. Test water may be
	discharged to the wet wells.
010	Per spec section 15028 – Instrumentation and Control Elements item 1 01 B, states "Programming the
Q19.	PLC controls shall be by the KCMO Water Services "Need to confirm if in fact PLC programming is being
	provided by the city or others or if the PCSS bidding on the job needs to include all required PLC/HMI
	programming?
A19.	Owner would like Contractor to include all Programming for PLC controls in the Contractor contract.
	Modifications to Section 15928, Paragraphs 1.01 A & B are included below.
Q20.	Drawing PD-002 & Specification 11283 call for a "Bolted SS Slide Plate". This appears to be a SS Slide
	Gate without a lift. Please confirm. In addition, the gate manufacturer recommends a lift be included as
	the opening and closing loads will be at least 4300# and 6400# respectively. Opening the gate will be
	possible by a crane/chain arrangement, but it will be nearly impossible to close the gate in the proposed
1 20	Correct the design is based on a SS Slide Gate without a lift. No lift is desired, and therefore will not be
A2U.	required. These gates are not intended to be opened. Please provide hid as specified
	required. These baces are not intended to be opened. Thease provide bid as specified.

### Specifications:

- Section 00210. Paragraph 27. Delete and Replace with the following: "Forward all questions in writing to the following Project Manager and Contract Administrator. Questions received less than ten (10) 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. "
- 2. Section 01140.01. Paragraph 3.01,A,3,b. Delete and Replace with the following: "The Contractor may assume that under normal dry weather flow conditions, that the City will allow shutdown of the pump station process for a period not to exceed 6 hours. The City has limited ability to reduce flow into to the influent structure during the shutdown. The 48 inch and 60 inch have flap gates that may allow for reduction of flow to the influent structure with modifications. There is a gate upstream on the 120" that the Contractor
may be utilized. The City cannot guarantee the effectiveness of the gate on the 120 inch line. During construction, the Contractor is responsible for diverting or bypassing flow to complete the work and the protection of their Work sites from sewer flow. The City has a cofferdam from previous projects that is available for the Contractor to Utilize. "

- 3. Section 01140. Paragraph 1.04.B.7. Delete and Replace with the following: "Notify the City at least 2 weeks in advance of any areas that will require cleaning. Cleaning work of built up material and disposal of related debris will be completed by the City in advance of the Contractor's work. Contractor shall provide the City appropriate notification time and time in the schedule for the Owner to coordinate and conduct the cleaning work. After the areas is turned over the Contract, further dewatering work and disposal of any normal residue is the responsibility of the Contractor."
- 4. Section 01140. Paragraph 1.04.F. Delete and replace with the following:
  - "F. Dewatering of existing process and disposal of residue:
    - Owner will clean built up debris from the influent structure, channels, mezzanine level, and wet wells in advance of Contractor's work. When the Owner has turned the process unit over to the Contractor for modification or temporary use, the Contractor is responsible for costs and procedures required to dewater and dispose of liquid, normally anticipated solids, etc. in the process unit unless the Owner has made prior arrangements.
      - a. Drainage and disposal of process unit liquids, normally anticipated solids, etc. into another treatment process unit on the site may be allowed if approved in advance by the Engineer and Owner and is conducted in accordance with the Project requirements.
      - b. Costs for dewatering, disposal of normal anticipated solids and residuals, and preparation of surfaces for the Work are Contractor's responsibility.
        - (1) Includes tipping fees for the removal and disposal of normally anticipated grit/debris.
      - c. Dewatering of normally anticipated grit/debris to meet landfill requirements is the responsibility of the Contractor.
      - d. Contractor shall provide adequate time in schedules for draining and cleanup of basins and channels. Contractor may assume that the influent structure will require 1 week to clean, the five channels will require a total of 2 weeks to clean, and each side of the wet well will require 2 weeks each."
- 5. Section 09960. Paragraph 3.05.A.1.b. Delete and Replace with the following:
  - "b. Warren Environmental
    - i. Repair Mortar: Warren Environmental series 301-14-5 Mastic troweled to a thickness of 1/2 inch DFT.
    - ii. Epoxy Coating: Warren Environmental single-coat epoxy system (301-14) at 250 to 500 mils DFT."
- 6. Section 15928. Paragraph 1.01 A. Delete and Replace with the following: "Develop the control system applications to implement the operational control descriptions for all systems as specified in Part 3 of the specifications. This section is provided to clarify control strategies to be used to program the system. Contractors shall provide all work necessary to provide programming, systems integration, PlantPAx graphics, vendor PLC and HMI equipment. The system shall be furnished, 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.

7. Section 15928. Paragraph 1.01 B. Delete and Replace with the following:

"Programmable Logic Controller (PLC) programming shall be by the Contractor. Human Machine Interface (HMI) programming shall be by the Contractor. System integration shall be by the Contractor. Contractor shall used a System Supplier for PLC/HMI/Systems Integration with the following qualifications.

Supplier's Qualifications: 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 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 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.

The following firms have been prequalified to perform the work:

R.E. 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.

2383 Chaffee Dr. St. Louis, MO 63146 314.432.2040

The System Suppliers not listed but wishing to be considered qualified shall be regularly engaged in the business of supply computer-based monitoring, control, and data acquisition systems of similar complexity and shall provide the following minimum information about their qualifications:

a. Number of design office staff that are qualified technical design personnel and the Allen Bradley training they have attended. System Supplier shall have a minimum of 5 qualified staff.

b. Number of competent and experienced service personnel to service the hardware and software furnished for this project.

c. The intended supplier shall furnish references including contact names, telephone numbers, and general project description shall be provided. The users and project lists shall be for similar control equipment, software, and type of projects.

d. Experience statement proving that the supplier has as a minimum 5 years of experience in the design, coordination and supply of computer-based monitoring, control, and data acquisition systems for water or wastewater facilities using Rockwell Software PlantPax and Allen Bradley PLCs."

### Drawings:

- 1. Sheet E103. Delete and Replace in its entirety. Changes are bubbled to show updates for location of and connection to the new PLC, and change of scale to 1/64" equals 1'-0".
- Sheet E-201. Note 5. Delete and Replace with the following: "New radar level sensors (2) over the wet well, Sensor #4 and Sensor #5. See sheet 102 for location information. Rosemont 5300 series with waveguide or equal.

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



drawn by TRW	CHECKED BY TRW	DATE SUBMITTE 6/29/22	ED	RANGE XX		TWP XX	SEC XX
	CONTRACTOR			DAT	ΈC	omple E	<sup>ted</sup>
contract no. 1662	CONTRACT DATE	MAP NO. XXXX	WO	ORK ORDER 1	NO.	DRAV	VING NO.
PROJECT NO. 81000928				SH	IEF	ET 45	OF 60





MISSOURI

City of Kansas City, Missouri 11th floor, City Hall 414 East 12th Street Kansas City, Missouri 64106

816-513-0304 Fax: 816-513-0226

DATE: April 18, 2019

TO: **Brent Herring Dave Silverstein** Blake Anderson

FROM: **Dave Hauser** 

RE: Peak Flows and Capacities of Birmingham Influent PS and WWTP

#### **Birmingham Influent PS and WWTP Peak Flows/Capacities**

This summary memo consolidates previous report documents and what was originally developed/assumed in various Smart Sewer Program (SSP) reports, such as the Long-Term Control Plan (LTCP), Joint Use Documents, Birmingham Field Investigation Reports, Basis of Design Memorandum for Birmingham Influent Pump Station, and WW Master Plan and model calibration reports, regarding the peak flows measured or observed at the Birmingham Influent PS and WWTP.

The purpose of this memo is to clarify a potential discrepancy in the flows and capacities of these facilities as observed by the City's Wastewater Treatment Division (WWTD) versus those currently modeled by the SSP Team.

#### **Background Information**

The Birmingham Project Area Field Report (April 2007), it was reported the maximum pump station capacity through existing 36-inch force main is 32 MGD. This report indicates the Pump Station's pumping capacity is greater than the 20 MGD treatment and 32 MGD hydraulic capacity of the WWTP.

In the Birmingham Basin Alternatives Tech Memo (August 2008), the capacity of each of the 6 pumps were provided. Since Pumps 2 through 5 are not operational and had been removed, the Mid-Range pumps Nos. 1 and 6 (installed in 2002) were reported as having a capacity of 18 MGD each. This report also reported that at the slowest operating speed each of these pumps can convey 10 MGD and at maximum operating speed each pump could convey 22 MGD.

The Joint Use Facilities Update Tech Memo (September 2008) indicated a WWTP capacity of 20 MGD average daily flow and 40 MGD peak flow. This report also indicated the actual hydraulic capacity is limited to 32 MGD by the final clarifier surface overflow and solids loading rates.

In the **Long-Term Control Plan (January 2009)**, in Table 5-11 (page 5-39), the maximum peak flow to the Birmingham WWTP varies from 19.5 MGD in 2003 to 32.5 MGD in 2007, with an average flow for the 5 years (2003 thru 2007) of 26.2 MGD.

The **Birmingham WWTP Stress Test (October 2010)** reported that the maximum capacity of the WWTP was 23 MGD which corresponds to the hydraulic capacity of the Final Clarifiers. Flows above 23 MGD causes an increase in solids discharge from the WWTP.

The **Basis of Design Memo for Birmingham PS Mid-range Pump Additions (October 2014)** led to the installation of newer Mid-Range Pumps. The Basis of Design Memorandum indicated a principal duty point of 11.5 MGD of the new Mid-Range Pumps, but the WW Master Plan indicates that Pump Station has a 45 MGD firm capacity with one of the 18 MGD (Pumps 1 & 6) out of service. It is believed the current pump station, independent of the single existing 36-inch diameter force main, has two 18 MGD pump operating (Pumps 1 & 6) and the two new 13.68 MGD (9,500 gpm) Mid-Range Pumps (Pumps 2 & 5) for a total capacity of approximately 63.36 MGD.

The **Wastewater Master Plan Report (August 2017)** has numerous reported and projected peak flows for the WWTP. Operational data from 2011 to May 2014 at the Birmingham WWTP revealed average daily flow of 10.9 MGD and a maximum daily flow of 28.4 MGD. As of 2016, the Birmingham Pump Station had a firm capacity of 28 MGD with Pumps 1 and 6 as the only operating pumps.

From the **Hydraulic Model (2019)** for this sewershed, the model indicates a peak flow of 95 MGD to the pump station without Liberty's flow for the 5-year design storm (SCS). This assumes the pump station is not a restriction itself, but free flowing conditions to the Birmingham Influent Pump Station.

The WWTD provided recent flow data for the Birmingham WWTP for the months of August 2018 thru Jan. 2019. The data included rainfall data as well and the Table 1 below shows the average and maximum daily wastewater flow and the monthly rainfall amount for each of these months.

MONTHS	AVG DAILY FLOW (MGD)	MAX DAILY FLOW (MGD)	MONTHLY RAINFALL (in)
August 2018	8.83	13.47	2.47
September 2018	8.28	10.32	1.58
October 2018	11.51	23.65	8.39
November 2018	9.06	20.29	1.59
December 2018	10.99	20.29	3.04
January 2019	12.33	18.20	1.78

Table 1 - Birmingham WWTP Flows Aug. 2018 thru Jan. 2019	rable 1 -	Birmingham	WWTP F	lows Aug.	2018 thru	Jan. 2019
--	-----------	------------	--------	-----------	-----------	-----------

Table 1 data shows that peak flows of approximately 24 MGD are getting to the WWTP and that flow to the Influent Pump Station is highly influenced by Inflow and Infiltration (I/I). The above period was a relatively dry period. The SSP does have on-going I/I Removal Projects in progress. In addition, the City of Liberty's WWTP went on-line in 2017 and this should help reduce flows to the pump station and WWTP.

#### **Data Summary**

Based on the above reports and information, the following results are noted:

- Early reports and data indicate that a peak hydraulic flow of approximately 32 MGD can be conveyed from the Birmingham Influent Pump Station and conveyed through the Birmingham WWTP. This flow rate was mainly limited by the existing 36-inch diameter force main and not necessarily by the Pump Station capacity. It was known the WWTP treatment capacity was less than this amount, but it was still thought that the WWTP could hydraulically handle 32 MGD.
- 2) For this reason, it appears the LTCP was developed with 32 MGD being the peak hydraulic flow the Birmingham PS and WWTP could convey and handle and so Wet Weather Flow Alternatives (tunnels and High Rate Treatment and PS) were developed for the LTCP for flows beyond 32 MGD.
- 3) Subsequently, additional Stress Testing and other Reports and improvement projects were evaluated to identify the peak flows and flooding that occurred at the Pump Station due to the excessive I/I flow that the Birmingham/Shoal Creek Sewersheds experience. These reports indicated that peak flows that could be discharged through the 36-inch force main was around 23 to 25 MGD.
- 4) Recent flow data indicate peak flows of between 20 and 24 MGD, which are in line with what WWTD says is the maximum operating capacity of the pump station and the treatment capacity of the WWTP.
- 5) It appears the main limiting factor is the existing 36-inch force main. At a 7.5 fps velocity, a 36-inch line should be able to convey up to 34.5 MGD. The Pump Station has that capacity, but depending on the system curve, the PS may not be able to deliver that amount of flow and any higher flow above 24 MGD will begin to wash out solids and begin to affect the plant's treatment performance.

#### **Recommendations**

- From the review of the above reports and data above, it does appear the peak hydraulic capacity of the Birmingham PS and WWTP have been reduced from about 32 MGD to around 24 MGD. This additional loss of capacity will need to be included in the future design of the HRT and Pump Station or any other long-term flow control strategy for the northside flows. This loss of capacity may be dependent on the final location (at the Pump Station site or at the WWTP site) of the HRT system and if a second force main is constructed as part of the overall improvements for the two facilities.
- 2) There are a few current projects that are complete, under design or construction that should reduce flow to the pump station and WWTP and they include:
  - a. Completion of City of Liberty, MO's own WWTP in 2017;
  - b. I/I Reduction: Birmingham 2 Area Project;
  - c. I/I Reduction: Birmingham 3 Area Project.
- 3) Until further SSP long-term improvements are made such as the high rate PS and High Rate Treatment System, there seems to be limited "near-term" improvements to help the current capacity situation at the PS or WWTP. Alternatives include:
  - a. Install parallel force main to help convey additional flow.
  - b. Install additional pumps and motors in PS that can handle higher heads and pump higher flow rates through the existing force main and operate these pumps only under peak flow conditions.

- c. Continue with the I/I reduction projects in the Birmingham sewersheds and perhaps look for additional I/I projects within the Birmingham WWTP service area to reduce the peak flow rates to these two facilities.
- d. The addition of an HRT system, or peak holding basins, equalization basins or treatment units at the WWTP to treat or handle the peak wet weather flows.



MISSOURI

### ADDENDUM NUMBER 8

Project Number<u>81000928</u> Project Title <u>Birmingham Pump Station Screen Replacement</u>

### ISSUE DATE: July 14, 2022

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on <u>July 19, 2022</u>, are amended as follows:

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

Due to the desire to limit the number of individuals in City Hall, we would like to communicate the option to attend the Public Bid Opening virtually for July 19, 2022.

- 1. We will allow Bidders to submit their bids at City Hall-1<sup>st</sup> Floor Rm. 102W by the 2:00 PM deadline mentioned in the Invitation for Bid.
- 2. We are offering a virtual meeting via the link and information for Microsoft Teams. The Bid Reading will be "Live" through any computer, tablet or mobile device using the provided link. You can also choose to call-in using the number provided as well.
- 3. The Bid Results will be posted to the KCMO Planroom like our normal process.

# Microsoft Teams meeting

Join on your computer or mobile app Click here to join the meeting Or join by entering a meeting ID Meeting ID: 252 376 074 959 Passcode: 9NMViy Or call in (audio only) +1 872-212-5076,,900938014# United States, Chicago Phone Conference ID: 900 938 014# Find a local number | Reset PIN Learn More | Meeting options

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



## **CERTIFICATION PAGE**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

I am responsible for the following specifications and drawings:

Drawings: Cover: G-000. Process Drawings: PD-001, PD002, PD-003, P-001, P-002, P-003, P-004, P-005, P-006, P-007, P-008, P-009.

Specifications: Division 00; Division 01;

- Division 02: Section 02270, 02300, & 02755;
- Division 05: Section 05515, & 05520;
- Division 09: Section 09960;
- Division 11: Section 11282, 11283, 11330, 11340, 11345, & 11350;

Division 13: 13721, 13779, & 13783.



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.





MISSOURI

# **CERTIFICATION PAGE**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

I am responsible for the following specifications and drawings:

Drawings: Structural Drawings: SD100, S100, S101, S102, S103, S104, S105 & S106.

Specifications: Division 03: Section 03100, 03150, 03200, 03260, 03300, 03600, 03610, 03620 & 03900.

Division 05: Section 05090 & 05500.



Mehdi (Mason) Mohseni, PE-2015000579

(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.



KANSAS CITY MISSOURI

### **CERTIFICATION PAGE**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

I am responsible for the following specifications and drawings:

Drawings: Mechanical Drawings: M-001, M-100, M-101, M-102, M-103, M-201, M-202, M-203, M-204, M-205, M-206, M-401, M-402, M-403, M-501, M-502, M-601, M-602 and M-603.

Specifications: Division 15:

Section 15086 – Ductwork Insulation Section 15192 – Natural Gas Piping Section 15723 – Packaged, Outdoor Makeup Air Units Section 15810 – Sheet Metal Ductwork Section 15835 – Roof-Mounted Exhaust Fans Section 15926 – DDC System – Outdoor Air Ventilation Equipment



(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.





# **CERTIFICATION PAGE**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

I am responsible for the following specifications and drawings:

Drawings: E-100, E-101, E-102, E-103, E-104, E-200, E-201, E-202, E-500, IC-100, IC-101, IC-102, IC-103, IC-104, IC-105, IC-106, IC-107, IC-108 and IC-109.

Specifications: Division 15 and 16

- Section 15928 Instrumentation and Control Elements Non-HVAC
- Section 16050 Basic Electrical Methods and Materials
- Section 16070 Hangers and Supports for Electrical Systems
- Section 16075 Identification for Electrical Systems
- Section 16123 Building Wire and Cables
- Section 16131 Electrical Conduit
- Section 16138 Boxes and Conduit Fittings
- Section 16140 Wiring Devices
- Section 16155 Equipment Wiring
- Section 16281 Molded-Case Circuit Breakers



(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.

### **TABLE OF CONTENTS**

CITY OF FOUNTAINS Heart of the Nation



Project Title: Birmingham Pump Station Screen Replacement



#### **INTRODUCTORY INFORMATION**

- 00005 Certification Page
- 00010 Table of Contents
- 00015 List of Drawings

#### **BIDDING REQUIREMENTS**

- 00130 Invitation to Bid
- 00210 Instructions to Bidders
- 00410 Bid Form
- 00410.01 Experience Reference Form
- 00410.02 Experience and Reference Summary
- 00410.03 List of Equipment and Staffing
- 00410.04 Equipment Questionnaire
- 00410.05 Instrumentation and Control System Supplier Questionnaire
- 00413 Allowance Form
- 00420 Alternates
- 00430 Bid Bond
- 00440 HRD 5: Construction Contract HRD Instructions
- 00450 HRD 8: Contractor Utilization Plan/Request for Waiver
- 00450.01 Letter of Intent to Subcontract
- 00460 HRD 10: Timetable for MBE/WBE Utilization
- 00470 HRD 11: Request for Modification or Substitution
- 00485 HRD Monthly Reporting Instructions
- 00485.01 MWBE Monthly Utilization Report
- 00485.02 Project Workforce Monthly Report
- 00485.02.1 Workforce Monthly Report Instructions
- 00485.03 Company Wide Workforce Monthly Report
- 00485.04 HRD Employee Identification Report Form
- 00485.05 Affidavit for Training
- CREO14 Affirmative Action Program Affidavit
- 00490 Pre-Contract Bidder's Certification Form

### **CONTRACTING REQUIREMENTS**

- 00515 Construction Contract Required Submissions
- 00515.01 Employee Eligibility Verification Affidavit
- 00560 Missouri Project Exemption Certificate
- 00560.01 Kansas City Missouri Tax Exempt Certificate
- 00610 Performance and Maintenance Bond Form
- 00615 Payment Bond Form
- 00620 Insurance Certificate Forms
- 00630 Revenue Clearance Release Authorization
- 00630.01 Revenue Clearance Sample Letter

- 00700 General Conditions
- 00800 Supplementary Conditions
- 00830 Wage Rate Requirements *Clay County*
- 00910 Construction Addenda
- 00930 Request for Interpretation Form
- 00930.01 Request for Interpretation Form Log
- 00931 Supplemental Design Instructions
- 00932 Request for Proposal
- 00933 Request for Proposal Log
- 00940 Change Order Form
- 00945 Work Change Directive

#### **DIVISION 1 – GENERAL REQUIREMENTS**

- 01000 General Project Requirements
- 01019 Closeout Procedures
- 01020 Record Documents
- 01021 Operation Maintenance Data
- 01110 Summary of Work
- 01140 Work Restrictions
- 01140.01 Process and System Shutdown Constraints Schedule
- 01140.02 Operational Change Control Plan Documents
- 01210 Allowances
- 01210.01 Allowance Authorization
- 01230 Alternates
- 01290.01 Application for Payment
- 01290.02 Schedule of Values
- 01290.03 Certified Payroll Report Instructions
- 01290.05 Certified Payroll Report Form
- 01290.07 Payroll Instruction
- 01290.09 Subcontractors and Major Material Suppliers List
- 01290.11 Daily Labor Force Report
- 01290.12 Certificate of Substantial Completion
- 01290.13 Punch List
- 01290.14 Contractor Affidavit for Final Payment
- 01290.15 Subcontractor Affidavit for Final Payment
- 01300 Submittals
- 01320 Construction Progress Documentation
- 01320.01 Daily Field Observation Report
- 01320.02 Periodic Field Observation Report
- 01320.03 Working Day Report
- 01322 Photographic Documentation
- 01329 Safety Plan
- 01330.01 Letter of Transmittal
- 01335 Document Management
- 01340 Project BIM Coordination
- 01340.A Attribute Standard V1.2
- 01352 Selective Alterations and Demolition
- 01354 Hazardous Material Procedures
- 01400 Quality Control
- 01410 Regulatory Requirements

- 01433 Manufacturers Field Services
- 01480 Water Tightness
- 01485 Cutting Coring and Patching
- 01490 Piping Penetrations
- 01500 Temporary Facilities
- 01565 Asbestos
- 01566 Cleanup Operations
- 01570 Temporary Erosion & Sediment Control
- 01580 Project Signs
- 01581 Public Communications
- 01600 Product Delivery Storage and Handling
- 01615 Equipment Identification and Tagging
- 01630 Substitution Request
- 01664 Training
- 01700 Traffic Control
- 01757 Commissioning
- 01810 Project Design Criteria

#### **DIVISION 2 – SITEWORK**

- 02270 Temporary Erosion and Sediment Control
- 02300 Earthwork
- 02755 Concrete Pavement

#### **DIVISION 3 – CONCRETE**

- 03100 Concrete Formwork
- 03150 Hydrophilic Rubber Waterstop
- 03200 Concrete Reinforcement
- 03260 Adhesive-Bonded Reinforced Rods in Concrete
- 03300 Cast-In-Place Concrete
- 03320 Asphalt Paving
- 03600 Grouting
- 03610 Epoxies
- 03620 Epoxy Resin Portland Cement Bonding Agent
- 03900 Structural Concrete Repair

#### DIVISION 4 – NOT USED

#### **DIVISION 5 – METALS**

- 05090 Mechanical Anchoring and Fastening to Concrete
- 05500 Metal Fabrications
- 05515 Aluminum Ladders and Accessories
- 05520 Metal Handrails and Guardrails

#### **DIVISION 6 – NOT USED**

#### DIVISION 7 – NOT USED

#### DIVISION 8 – NOT USED

#### **DIVISION 9 – FINISHES**

09960 High Performance Coatings

#### **DIVISION 10 – NOT USED**

#### **DIVISION 11 – EQUIPMENT**

- 11282 Cast Iron Gates
- 11283 Stainless Steel Slide Plates
- 11330 Mechanical Bar Screens
- 11340 Conveyor
- 11345 Dumpsters
- 11350 Odor Control System

#### **DIVISION 12 – NOT USED**

#### **DIVISION 13 – SPECIAL CONSTRUCTION**

- 13721 Ultrasonic Level Meters
- 13779 Combustible Gas Analyzers
- 13783 Hydrogen Sulfide Analyzers

#### **DIVISION 14 – NOT USED**

#### **DIVISION 15 – MECHANICAL**

- 15086 Ductwork Insulation
- 15192 Natural Gas Piping
- 15723 Packaged, Outdoor, Makeup Air Units
- 15810 Sheet Metal Ductwork
- 15835 Roof-Mounted Exhaust Fans
- 15926 Direct Digital Control System Outdoor Air Ventilation Equipment
- 15928 Instrumentation and Controls Elements (Non-DCC HVAC Controls)

#### **DIVISION 16 – ELECTRICAL**

- 16050 Basic Electrical Materials and Methods
- 16070 Hangers and Supports for Electrical Systems
- 16075 Identification for Electrical Systems
- 16123 Building Wire and Cables
- 16131 Electrical Conduit
- 16138 Boxes
- 16140 Wiring Devices
- 16155 Equipment Wiring
- 16281 Molded-Case Circuit Brakes





# LIST OF DRAWINGS

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

Item	Set /Title /Description /Designation	Drawing No(s).	Dated
1	COVER SHEET	G-000	3/18/2022
2	DEMOLITION PLAN ELEVATION 704.00	PD-001	3/18/2022
3	DEMOLITION PLAN ELEVATION 724.00	PD-002	3/18/2022
4	DEMOLITION PLAN ELEVATION 733.00	PD-003	3/18/2022
5	FLOW DIAGRAM	P-001	3/18/2022
6	EQUIPMENT PLAN ELEVATION 704.00	P-002	3/18/2022
7	EQUIPMENT PLAN ELEVATION 724.00	P-003	3/18/2022
8	EQUIPMENT PLAN ELEVATION 734.00	P-004	3/18/2022
9	SECTION SHEET 1 OF 3	P-005	3/18/2022
10	SECTION SHEET 2 OF 3	P-006	3/18/2022
11	SECTION SHEET 3 OF 3, ODOR CONTROL DETAILS	P-007	3/18/2022
12	DRIVE MODIFICATIONS	P-008	3/18/2022
13	PUMP DISCHARGE PIPING	P-009	3/18/2022
14	DEMO PLAN	SD100	3/18/2022
15	GENERAL NOTES	S100	3/18/2022
16	OVERALL PLAN	S101	3/18/2022
17	OPERATING FLOOR PLAN	S102	3/18/2022
18	NORTH PLAN FLOOR EL. 724.00	\$103	3/18/2022
19	SECTIONS AND DETAILS - SHEET 1	S104	3/18/2022
20	SECTIONS AND DETAILS - SHEET 2	S105	3/18/2022
21	TYPICAL DETAILS	S106	3/18/2022
22	EXISTING SCREEN ROOM MAKEUP AIR UNIT DEMOLITION	M-204D	3/18/2022
00	MAKEUP AIR UNIT/EXHAUST FAN VENTILATION AIRFLOW	M 204D	0,10,2022
23	SCHEMATIC	M-001	3/18/2022
24	PUMP STATION VENTILATION EQUIPMENT-SITE PLAN	M-100	3/18/2022
25	PUMP STATION VENTILATION EQUIPMENT-ROOF PLAN	M-101	3/18/2022
26	MAIN OPERATING FLOOR VENTILATION SYSTEM PLAN	M-102	3/18/2022
27	SCREEN ROOM VENTILATION SYSTEM PLAN	M-103	3/18/2022
28	NEW MAKEUP AIR UNIT, MAU-3, DETAILS	M-201	3/18/2022
29	NEW MAKEUP AIR UNIT, MAU-4, DETAILS	M-202	3/18/2022
30	NEW MAKEUP AIR UNIT, MAU-5, DETAILS	M-203	3/18/2022
31	NEW MAKEUP AIR UNIT, MAU-6, DETAILS	M-204	3/18/2022

32	EXISTING DRY WELL VENTILATION SYSTEM DUCTWORK	M-205	3/18/2022
33	EXISTING DRY WELL EXHAUST FAN DUCTWORK	M-206	3/18/2022
34	DRY WELL-UPPER LEVEL VENTILATION SYSTEM PLAN	M-401	3/18/2022
35	DRY WELL-MIDDLE LEVEL VENTILATION SYSTEM PLAN	M-402	3/18/2022
36	DRY WELL-LOWER LEVEL VENTILATION SYSTEM PLAN	M-403	3/18/2022
37	NEW MAKEUP UNIT DETAILS	M-501	3/18/2022
38	VENTILATION AIR DISTRIBUTION DETAILS	M-502	3/18/2022
39	MECHANICAL EQUIPMENT SCHEDULES	M-601	3/18/2022
40	MAKEUP AIR UNIT AND EXHAUST FAN CONTROL		
-0	DIAGRAMS AND DETAILS	M-602	3/18/2022
41	MAKEUP AIR UNIT AND EXHAUST FAN CONTROL	M 603	3/18/2022
42	FLECTRICAL LEGEND AND ABBREVIATIONS	F-100	3/18/2022
43		E-100 E-101	3/18/2022
44	POWER AND CONTROL IN SCREEN ROOM	E-107	3/18/2022
45	POWER PLAN ELEVATION 744	E-102 E-103	3/18/2022
46	LIGHTING PLAN LEVEL 724	E-104	3/18/2022
47	MOTOR CONTROL CENTERS	E-200	3/18/2022
48	ELECTRICAL POWER & CONTROLS BUILDING SECTION	E-201	3/18/2022
49	PARTIAL ELECTRICAL ONE-LINE DIAGRAM	F-202	3/18/2022
50	EQUIPMENT INSTALLATION DETAILS	= = = = F-500	3/18/2022
51	INSTRUMENTATION LEGEND AND ABBREVIATIONS	IC-100	3/18/2022
52	INSTRUMENTATION LEGEND AND ABBREVIATIONS	IC-101	3/18/2022
53	SCREEN INSTRUMENTATION AND CONTROL	IC-102	3/18/2022
54	GATE ACTUATORS I&C SIGNALS	IC-103	3/18/2022
55	ODOR CONTROL I&C SIGNALS	IC-104	3/18/2022
56	H2S AND COMBUSTIBLE GAS DETECTION I&C SIGNALS	IC-105	3/18/2022
57	CONVEYOR INSTRUMENTATION AND CONTROL SIGNALS	IC-106	3/18/2022
58	INSTRUMENTATION ONE-LINE DIAGRAM	IC-107	3/18/2022
59	INSTRUMENTATION PANELS ELEVATION	IC-108	3/18/2022
60	CONTROL BLOCK DIAGRAM	IC-109	3/18/2022



INVITATION TO BID

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

The General Services Department of Kansas City, Missouri will receive sealed Bids until 2:00 PM, on Tuesday, *July 12th, 2022* at 414 E. 12<sup>th</sup> Street, Room 102W, Kansas City, Missouri 64106 for Project No. 81000928/Contract No. 1662, Birmingham Pump Station Screen Replacement. Bids will be opened after that time at the same 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 (**12%**) MBE participation and (**12%**) WBE participation.

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

**<u>Pre-Bid</u>** Conference The Water Services Department will hold a mandatory Pre-Bid Conference on Tuesday, June 22, 2022 at 11:00 AM Virtually through MS Teams. The Teams meeting can be accessed by contacting Project Manager within 48 hours of the meeting and requesting the meeting invitation be forwarded to their e-mail address. Conference ID: 393 992 252#. The Teams Meeting information is provided Below. The meeting can also be accessed by phone at +1 872-212-5076, Conference ID: 393992252#. Attendance at Pre-BID conference is mandatory for all Bidders on this project. For this project, the City not contract with Bidder who has not attended the entire pre-Bid conference for this project.

# Microsoft Teams meeting

Join on your computer or mobile app <u>Click here to join the meeting</u> Or call in (audio only) +1 872-212-5076,,393992252# United States, Chicago Phone Conference ID: 393 992 252# <u>Find a local number | Reset PIN</u> <u>Learn More | Meeting options</u>

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

Contract Administrator: Derrick Smith Phone Number: (816) 513-0807 E-mail: Derrick.Smith@kcmo.org

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





### **INSTRUCTIONS TO BIDDERS**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

1. Sealed Bids for the **Project/Contract No. 81000928/1662, Birmingham Pump Station Screen Replacement** project will be received by the General Services Department at 414 E. 12<sup>th</sup> Street, Room 102W, Kansas City, MO 64106 until **2:00 P.M., Tuesday, July 12<sup>th</sup>, 2022** 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 hundred twenty (120) days after the Bid is opened. Bid security shall likewise continue for the same hundred twenty (120) 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 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. <u>Consideration of Bids</u>
  - a. The City will determine the lowest and best 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. <u>Alternates</u>. 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 and best Bid. In determining lowest and best 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.
  - c. <u>Required Alternates.</u> If the solicitation includes Required Alternates, Bidder shall include as a part of their Bid. To be considered a compliant Bid, Required Alternates shall be included in the submission by Bidder. Any and all Bids that do not include City's Required Alternates may be rejected. The following Required Alternates are listed below.
    - (1) Required Alternate 1: Parkson Aqua Caiman®
    - (2) Required Alternate 2: Per Sheet SD100, Note 8, Removal of existing concrete blocks in channels and patch as necessary.
    - (3) Required Alternate 3: 120 Day bid escalation
    - (4) Required Alternate 4: 150 Day bid escalation

3. <u>Evidence of Competency to Perform.</u> 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.
- 1. 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. <u>Waiver of Bid Requirements</u> 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 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. <u>Late Bids</u> 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. <u>Interpretations and Addenda</u> 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. <u>Bid Security Requirements</u> 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. <u>Forfeiture of Security</u> 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. <u>Mistake in Bid Security</u> 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. <u>Bids that Exceed the Engineer's Estimate</u> The City may offer the apparent lowest and best 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. <u>Post Bid Required Submissions</u> 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. <u>Indemnification – City of Kansas City.</u> 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. <u>City's Buy American and Missouri Preference Policies</u> 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 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. <u>Affirmative Action</u> 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 HRD at (816) 513-1836 or visit the City's website at <u>www.kcmo.gov</u>.

15. <u>Tax Clearance</u> 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. <u>Substitutions or "Or-Equal" Items</u> The procedure for submission of substitutions or "or-equal" items is set forth in the General Conditions and Supplementary Conditions.

17. <u>Prevailing Wage Requirements</u> 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. <u>Contract Information Management System</u>. 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. <u>MBE/WBE Program Requirements</u> 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 (12%) MBE participation and (12%) WBE participation. The City's HRD Forms and HRD 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 <u>www.kcmo.gov.</u> Please call the Human Relations 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. <u>Waiver of MBE/WBE Requirements</u> 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 and best 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 HRD Construction Contractor Utilization Plan/Request for Waiver (HRD Form 8) and 00450.01 Letter of Intent to Subcontract for each MBE/WBE listed on the 00450 HRD Construction Contractor Utilization Plan/Request for Waiver (HRD Form 8) and 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. <u>Workforce Program Requirements.</u> 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 HRD Forms and HRD 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 and best 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 and best 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 Subcontract 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 and best bidder in any subsequent City contracts.

24. <u>Pre-Bid Conference</u> The Water Services Department will hold a **mandatory** Pre-Bid Conference on **Tuesday**, **June 22**, **2022 at 11:00 AM** Virtually through MS Teams. The Teams meeting can be accessed by contacting Project Manager within 48 hours of the meeting and requesting the meeting invitation be forwarded to their e-mail address. Conference ID: 393 992 252#. The Teams Meeting information is provided below. The meeting can also be accessed by phone at +1 872-212-5076, Conference ID: 393 992 252#. Attendance at Pre-BID conference is **mandatory** for all Bidders on this project. For this project, the City not contract with Bidder who has not attended the entire pre-Bid conference for this project.

### Microsoft Teams meeting

Join on your computer or mobile app <u>Click here to join the meeting</u> Or call in (audio only) <u>+1 872-212-5076,,393992252</u># United States, Chicago Phone Conference ID: 393 992 252# 25. <u>On-Site Inspection</u> The Project Site will be available for inspection by Bidders. Bidders visiting the Project Site shall be responsible for their own safety. The Project Site shall be available for inspection by appointment from 8:00 AM to 3:00 PM each day Monday through Friday (holidays excepted). Bidders may contact the following individual from the Water Services Department for an appointment.

Contact:	David Elge
Phone:	816-513-0347
E-mail:	David.Elge@kcmo.org

26. <u>Signatures</u> 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:

 $\Box$  a partner authorized to sign on behalf of the partnership.

#### Sole Proprietor:

 $\Box$  the proprietor.

#### Joint Venture:

 $\Box$  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:

 $\Box$  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 three (3) 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. 63<sup>rd</sup> Street Kansas City, Missouri 64130 Telephone: 816-513-0347 Email: David.Elge@kcmo.org

Derrick Smith, Procurement Officer General Services Department, Procurement City Hall, City of Kansas City, MO 414 E. 12<sup>th</sup> Street, 1<sup>St</sup> Floor W Kansas City, MO 64106 (816) 513-0807 E-mail: Derrick.Smith@kcmo.org



For persons with disabilities needing reasonable accommodations please contact Jean Lawson at 816-513-6566. If you need to use the Relay Service, please dial 711.



### **BID FORM/CONTRACT**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

- 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. 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 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>100,000.00</u>
TOTAL BID IN NUMERIC FIGURES	\$
TOTAL BID REQUIRED ALTERNATE 1	\$
TOTAL BID REQUIRED ALTERNATE 2	\$
TOTAL BID REQUIRED ALTERNATE 3	\$
TOTAL BID REQUIRED ALTERNATE 4	\$

- 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 hundred twenty (120) days after the day Bids are opened.

- 7. The undersigned Bidder certifies that this Bid contains no modifications, deviations, riders or qualifications.
- 8. Form 00413 Allowances contain prices included in the Base Bid, and are incorporated into this Bid. Form must be completed and returned with this Bid.
- 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:



- 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 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.
- 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 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:	12% MBE	12% 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 <u>currently</u> be certified by Kansas City, Missouri Human Relations Department)

A.	Name of M/WBE Firm
	I elephone No.
	I.K.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/WRF Firm
C.	Address
	Telephone 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
2.	Address
	Telephone No
	I.R.S. No.
	Area/Scope of work
	Subcontract amount

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

Bidder:

(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 HRD 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 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.

Bidder: \_\_\_\_\_

**Business Entity Type:** 

() Mis	ssouri Corporation
( ) For	eign Corporation
( ) Fic	titious Name Registration
() Sol	e Proprietor
( ) Lin	nited Liability Company
() Par	tnership
( ) Join	nt Venture
$(\overline{})$ Oth	er: (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:

#### 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:

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

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

Required Alternate No. 1:	\$
Required Alternate No. 2:	\$
Required Alternate No. 3:	\$
Required Alternate No. 4:	\$

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 Numbers: <u>81000928/1662</u>

Project Title: Birmingham Pump Station Screen Replacement

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

NO.	PROJECT & LOCATION	OWNER NAME & ADDRESS	PROJECT DURATION &	\$ VALUE
1.		CONTACT & THONE NUMBER	DATE COMILETED	
2				
۷.				
3.				
4.				
5.				
6.				
7				
7.				
8.				
9.				





### **EXPERIENCE AND REFERENCE SUMMARY – CURRENT PROJECTS**

Project/Contract Numbers: <u>81000928/1662</u>

Project Title: Birmingham Pump Station Screen Replacement

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.					




KANSAS CITY MISSOURI

# LIST OF EQUIPMENT AND STAFFING AVAILABLE FOR PROJECT

Project/Contract Numbers: <u>81000928/1662</u>

Project Title: Birmingham Pump Station Screen Replacement

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

The 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 a contract, the 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
Section 11282 – Cast Iron Gates	
Section 11330 – Mechanical Bar Screens	
Section 11340 – Conveyor	
Section 11350 – Odor Control	
Section 15723 – Makeup Air Units	

#### END OF SECTION

# SECTION 00410.05 – INSTRUMENTATION AND CONTROL SYSTEM SUPPLIER QUESTIONNAIRE

The Bidder shall submit with its Bid a copy of this Instrumentation and Control System Supplier Questionnaire completed by Bidder's intended Instrumentation and Control System Supplier. Owner will review and evaluate the information before award of the Contract.

Upon award of a contract, the named Instrumentation and Control System Supplier shall be employed to perform the work and the named equipment shall be furnished, unless changes are specifically authorized by Owner. 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.

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 Instrumentation and Control System Supplier Questionnaire may be cause for rejection of the Bid.

1.	Instrumentatio	on and Control System Supplier	
	Addre	SS	
	Telep	hone Number	
2.	Number of Fu	ll-Time Design Personnel on Staff	
3.	Number of Fu (not including	ll-Time Service Personnel on staff personnel in line 2 above.)	
4.	Geographic Lo Project	ocation of Service Personnel for this	
5.	Number of yes Similar Work	ars Supplier has successfully Provided	
	a.	Reference- Project Owners Name	
		Address	
		Contact Person's Name	
		Telephone Number	
004	410.05 – 1 of 2		Kansas City, Missouri
Rev	vised 07/12/21		Water Services Department
			Birmingham Pump Station Screen Replacement

	General Description of the project	
b.	Reference- Project Owners Name	
	Address	
	Contact Person's Name	
	Telephone Number	
	General Description of the project	
c.	Reference- Project Owners Name	
	Address	
	Contact Person's Name	
	Telephone Number	
	General Description of the project	

6. Manufacturers of Principle Devices for use on this Project. (one manufacturer only for each item)

a.	Section 13721 Ultrasonic Level Meters	
b.	Section 13779 Combustible Gas Analyzers	
c.	Section 13783 Hydrogen Sulfide Analyzers	

END OF SECTION



MISSOURI

# ALLOWANCE FORM

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

Allowance No.:	Allowance Description:	Allowance in Figures:
1	Unforseen Site Conditions	\$100,000.00
	1	
1		

CITY OF FOUNTAINS Heart of the Nation



MISSOURI

# ALTERNATES

Project/Contract Numbers: 81000928/1662

# Project Title: Birmingham Pump Station Screen Replacement

Page 1 of 1

No:	Description:	□ Add [+]	Price in Figures:
			i nee ni i galeen
		🖵 Deduct [-]	
1	Parkson Agua Caiman® screens is substituted from the		
•	Tarkson Aqua Cannan@ sereens is substituted nom the		
	Duperon FlexRake® listed in Section 11330 Paragraph		
	Duperon l'iextunces instea in Section 11550, l'augruph		\$
	2.01. A		Ŷ

No:	Description:	□ Add [+]	Price in Figures:
2	Per Sheet SD100, Note 8, Removal of existing concrete	□ Deduct [-]	
	blocks in channels and patch as necessary.		\$

No:	Description:	🛛 Add [+]	Price in Figures:
		Deduct [-]	
3	120 day bid escalation		
	Change in cost if the bid is awarded 120 days after the bid opening (Instead of 90 days as listed in 00210 Paragraph 1.a.		\$

No:	Description:	□ Add [+]	Price in Figures:
		Deduct [-]	_
4	150 day bid escalation		
			¢
	Change in cost if the bid is awarded 150 days after the		Φ
	bid opening (Instead of 90 days as listed in 00210		
	Paragraph 1.a.		



KANSAS CITY



Project/Contract Numbers: 81000928/1662

#### Project Title: Birmingham Pump Station Screen Replacement

Bond Number

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

Ву: \_\_\_\_\_

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.

Title:\_\_\_\_\_

Ву:\_\_\_\_\_

Date:

(Attach seal and Power of Attorney)

#### HRD INSTRUCTIONS

#### FOR CONSTRUCTION CONTRACTS

#### PART A. MINORITY/WOMEN BUSINESS ENTERPRISE REQUIREMENTS

#### I. City's MBE/WBE Program.

- A. The City has adopted a 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 Human Relations Department ("HRD") 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 HRD Forms are attached and must be used for MBE/WBE submittals:
  - 1. Contractor Utilization Plan/Request for Waiver (HRD Form 8); and
  - 2. Letter of Intent to Subcontract (HRD Form 00450.01); and
  - 3. Timetable for MBE/WBE Utilization (HRD Form 10); and
  - 4. Request for Modification or Substitution (HRD 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 Human Relations 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 HRD 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 (HRD 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, HRD will examine the Bidder's documentation of good faith efforts and make a recommendation to grant or deny the waiver. HRD 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 (HRD 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 (HRD Form 10).
  - 2. Documentation of good faith efforts.

#### **IV. Required Monthly Submissions during term of Contract.**

- A. Bidder must submit the following document on a monthly basis if awarded the contract:
  - 1. **M/WBE Monthly Utilization Report.** This report must be submitted to the Director by the 15<sup>th</sup> of each month. Failure to submit timely reports may result in delays in processing of current and future contract approvals and payment applications. The preferred method of submission of this report is through the B2GNow Diversity Management System (B2GNow) HRD Form 00485.01 may be submitted in lieu of the B2GNow system under certain conditions, with the consent of HRD.

## 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 (HRD 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 HRD 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 HRD 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 HRD 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 HRD 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
- j. 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. Within five (5) working days after drawing the bid specifications, sent 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 (HRD 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 (HRD 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 HRD 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 HRD 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 (HRD Form 00450.01).

#### XIII. Liquidated Damages – 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 <u>more than</u> 800 construction labor hours, (2) has estimated costs that <u>exceed \$300,000.00</u>, 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 Human Relations Department ("HRD") 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 HRD, a Bidder not doing so is required to objectively demonstrate to HRD that good faith efforts have been made.
- F. The following HRD Forms are to be used for Construction Employment Program submittals:
  - 1. Project Workforce Monthly Report (HRD Form 00485.02)
  - 2. Company-Wide Workforce Monthly Report (HRD Form 00485.03)

#### II. Required Submissions.

A. Within forty-eight (48) hours after bid opening, the construction contractor shall submit the **Construction Employee Identification Report** (HRD Form 00485.03) 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** (HRD Form 00485.03).
- 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** (HRD Form 00485.03) for the subcontractor.
- B. The HRD 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 HRD Director will allow paper submission

of the following HRD Forms in lieu of on-line submission if the on-line submission process presents a hardship to the contractor:

- 1. Project-Specific Workforce Monthly Report (HRD Form 00485.02)
- 2. Company-Wide Workforce Monthly Report (HRD Form 00485.03)
- C. Bidder must submit the following documents through B2GNow or in paper format on a monthly basis if awarded the contract:
  - 1. **Project Workforce Monthly Report (HRD Form 00485.02).** This report is contract specific. This report must be submitted to the Director by the 15<sup>th</sup> 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 (HRD Form 00485.03). 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 15<sup>th</sup> 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 HRD. 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 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 HRD 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 HRD 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 HRD 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 HRD 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 <u>81000928</u>	-
Project Title <u>Birmingham Pump Station Screen Replacement</u>	
(Department Project)	Department
(Bidder/Proposer)	

STATE OF \_\_\_\_\_

) ss COUNTY OF I, , of lawful age and upon my oath state as follows:

- This Affidavit is made for the purpose of complying with the provisions of the MBE/WBE 1. 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 goals are 12 % MBE and 12 % WBE. 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

3. 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)

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

b.	Name of M/WBE Firm
	Address
	Telephone No.
	I.R.S. No.
C.	Name of M/WBE Firm
	Address
	Telephone No.
	I.R.S. No.
1	
a.	
	Address
	Telephone No.
	I.R.S. No
e.	Name of M/WBE Firm
	Address
	Telephone No.
	I.R.S. No.
£	Nome of M/WDE Eime
1.	
	I elephone No.
	I.K.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**

<b>MBE FIRMS:</b>				
Name of MBE Firm	Supplier/Broker/Contractor	Subcontract Amount*	Weighted Value**	% of Total Contract

00450 HRD 08 Utilization Plan & Req. for Waiver 050113

Contract Central

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 HRD Forms and Instructions for allowable credit and special instructions for suppliers.

5. 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 app	plicable)
Subscribed and sworn to before n	ne this	day of	, 20
My Commission Expires:			

Notary Public



PART I: Prime Contractor\_\_\_\_\_\_agrees to enter into a contractual

agreement with M/W/DBE/Section 3 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/Section 3 Subcontractor is, to the best of Prime Contractor's knowledge, currently certified with the City of Kansas City's Human Relations 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 <u>IS NOT</u> subcontracting any portions of the above-stated scope of work(s). (Continue to Part 3.)

The M/W/DBE Subcontractor listed above <u>IS</u> 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 (circle 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: \_\_\_\_\_

# NOTE: SIGNATURES AND NOTARIZATIONS REQUIRED FOR NEW LETTERS OF INTENT (LOI); <u>SIGNATURES ONLY</u> FOR UPDATED LOI (ADDING VALUE TO EXISTING CONTRACT).

PRIME CON	VTRACTOR BUSINESS NAME	3:
Signature: Prin	me Contractor	Print Name
Title		Date
State of	)	
County of	)	
I, and I	belief.	state that the above and foregoing is based on my best knowledge
	Subscribed and sworn to before day of, 20	ore me, a notary public, on this
	My Commission Expires:	
<b>STAMD</b>		Notary Public
MWDBE SU	JBCONTRACTOR BUSINESS	NAME: Print Name
Title		Date
State of	)	
County of	)	
I, and l	belief.	state that the above and foregoing is based on my best knowledge
	Subscribed and sworn to before day of, 20	ore me, a notary public, on this
	My Commission Expires:	
STAMP:		Notary Public

# **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 th	ıat

(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 30 days 45 days 60 days Other		75 days 90 days 105 days 120 days (Specify)		135 days 150 days 165 days 180 days	
Throughout		Begin	ning 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 Human Relations Department in advance of the change.

If you have any questions regarding the completion of this form, please contact the Department of Human Relations at: (816) 513-1818.

(Signature)

(Position with Firm)

(Date)



**REQUEST FOR MODIFICATION OR SUBSTITUTION** 

(This Form **must** be submitted to HRD 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 applical	ble)
Project Goals: Contractor Utilization Plan:	%         MBE         %         WBE           %         MBE         %         WBE
1. I am the duly authorized representative of the above request this substitution or modification on behalf of	e Bidder/Contractor/Proposer and am authorized to f the Bidder/Contractor/Proposer.
2. I hereby request that the Director of HRD recommen	nd or approve: (check appropriate space(s))
a. A substitution of the certified MBE/W	VBE firm ,
to perform	(Name of new firm)
(Scope of work to be p	performed by new firm)
for the MBE/WBE firm( <i>Name of old j</i>	<i>firm)</i> which is currently
listed on the Bidder's/Contractor's/Propose	er's Contractor Utilization Plan to
perform the following scope of work:	(Scope of work of old firm)
b. A modification of the amount of Bidder's/Contractor's/Proposer's Contractor	MBE/WBE participation currently listed on the or Utilization Plan from

<u>% MBE</u>% WBE (Fill in % of MBE/WBE Participation currently listed on Contractor Utilization Plan)

#### ТО

<u>% MBE</u> % 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)

\_\_\_\_\_

# HRD 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 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 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 City, which will allow Contractors and Subcontractors to enter data and report on Workforce compliance.

#### CITY OF KANSAS CITY, MISSOURI Human Relations Department M/WBE MONTHLY UTILIZATION REPORT

Report Date: Project Name:			City Project Number:					
Project Address:			Contract Award I	Date:		City Vendor ID:		
General Contractor (GC): Contact Person/Phone:			City Contract Nu	mber:		City Department Name		
			General Contract	t Amount:	Total Amount I	Paid By City To Da	ate:	
General Contractor Address:				\$ Contract Goals:		\$% DBE	% MBE	% WBE
Email Address:				Total Contract Da	ays:		Completion Date:	
MBE/DBE	Date of	Date of	Subcontract	% of Total	Estimated	Amount Paid	Amount Paid	% of Contract
Subcontractor	Certification	Subcontract	Amount	Contract	Start date	This Period	To Date	Paid to Date
WBE/DBE								
Subcontractor								
<b>T</b> - 4 - 1 -								
Totais	<u> </u>					ļ	ļ	
Contractor should sub of each month.	mit report by the 15t	h		Narrative:				
Phillip Yelder, Director								
Human Relations Depart	ment							
414 E. 12th Street, 4th Floor								
Kansas City, MO 64106								
Phone: 816-513-1836								
FAX: 816-513-1805								
Report Submitted By: Da		ate						

**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 amendements 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 advised to consider the effect of any Change Order or amendment, and to submit a Request for Modification/Substitution if appropriate.

			Pro	ject Sp	pecif	ic Mo	nthly	Repo	rt					
			Human Relations Department - City				of Kans	as City M	issouri					
Report Date:		Reporting Period:					Project D	escriptior	ı:					
Project Name:		Contractor	:					Awarded	Date:			-		
City Project Number:			Contractor	Address:				City Contract Number:						
Project Address:	ISS:							City Vend	or ID:					
			Contact Pe	erson/Phone:		Contracto	r Report		Subcont					
E-mail Address:				•	ł	•	÷	Final Curr	ulative F	Report:	1	-	Yes	No
Report the total monthly hours of work performed by all wor			kers on the	City Construe	r the total	hours on a	ll lines an	d in all colu	imns.					
workforce hours should be	based on payroll reco	rds.		-										
JOB CATEGORIES	OVERALL TOTAL (Sum of all Columns, A thru F Male & Female)	Total White E	A B I Hours Total H Employees Black Emp		lours Total Hours ployees Hispanic Employees		C Hours banic oyees	D Total Hours Asian/Pacific Islander		E Total Hours Native American Employee		F Total Hours Other/Unknown Race Employee		G KCMO Resident Hours
		M		М	F	М	F	M F		M F		М	F	Total #
Foreman/Supervisor														
Journeyman														
Asbestos Worker														
Boilermaker Journeyman														
Boilermaker Apprentice														
Bricklayer Journeyman														
Bricklayer Apprentice														
Carpenter Journeyman														
Carpenter Apprentice														
Cement Mason Apprentice														
Electrician Journeyman														
Electrician Apprentice														
Elevator Constructor														
Journeyman														
Apprentice														
Glazier Journeyman														
Glazier Apprentice														
Iron Worker Journeyman														
Iron Worker Apprentice														
Laborer Journeyman														
Operating Engineer														
Journeyman Operating Engineer														
Apprentice Bainter Journovman														
Painter Apprentice													-	
Pipe Fitter/Plumber														
Journeyman Pipe Fitter/Plumber														
Apprentice Plastorer Journoumen														
Plasterer Journeyman														
Roofer Journeyman														
Roofer Apprentice													-	
Sheet Metal Journeyman														
Sheet Metal Apprentice														
Sprinkler Fitter														
Sprinkler Fitter Apprentice														
Truck Driver Journeyman												<u> </u>		
Welder Journeyman													<u> </u>	
Welder Apprentice														
Other														
Monthly Total Hours														-
Total % of Monthly Hrs.														
Contractor shall submit report by	the 15th of each month.						Decesto	h maitte d. P						
414 E. 12th Street, 4th Floor Kansas City, MO 64106								binitted By:		<u>г</u>			1	
Phone: 816-513-1836 Email	HRDcontractcompliance@	kcmo.org	1	1	1	1	Date:	•	•		•			t

# Workforce Monthly Report Forms only apply to Construction Contracts greater than \$324,000.01 with greater than 800 projected labor hours.

## Workforce Monthly Report Instructions

(Instructions for Forms: 00485.02 Project Workforce Monthly Report 020408 and 00485.03 Company Wide Workforce Monthly Report 020408)

- 1. <u>Report Date</u>: Insert the date the report was completed.
- 2. <u>Reporting Period</u>: Insert the reporting month for hours performed.
- 3. <u>Project Description:</u> Insert the description/type of the project.
- 4. <u>Project Name:</u> Insert the name of the project for which the report is submitted.
- 5. <u>Contractor</u>: Insert the name of the Contractor.
- 6. <u>Contract Award Date</u>: Insert the date the Contract was awarded.
- 7. <u>City Project Number</u>: Insert the Project number assigned by the City.
- 8. Contractor Address: Insert the Contractor's address.
- 9. <u>City Contract Number</u>: Insert the City contract number.
- 10. <u>City Vender ID:</u> Insert the General Contractor's City Vender ID number.
- 11. Project Address: Insert the project street address or location.
- 12. <u>Contact Person/Phone:</u> Insert the name and phone number of the Contractor's contact person for the project.
- 13. <u>Contractor Report / Subcontractor Report</u>: Please check the box to indicate whether this is the contractor's report or subcontractors' summary report.
- 14. Email Address: Insert the contact person's email address.
- 15. Final Cumulative Report/Request for Retainage: Click box to mark whether report is final.
- 16. Job Categories: Select the appropriate Job Category for the worker.
- 17. <u>Overall Total:</u>\* Insert the total number of labor hours per trade (do not include resident hours in this total).
- 18. <u>Monthly Total Hours:</u>\* Insert the sum of all columns, A through G, male, female and residents for the month.
- 19. <u>Total Percentages of Monthly Hours:</u>\* Insert the total percentages of hours by race, gender and Kansas City, Mo resident for the month.
- 20. <u>Cumulative Total Hours</u>: Insert the total number of hours in each category plus the previous months' cumulative total hours through the duration of the project.
- 21. <u>Total Percent of Cumulative Hours</u>:\* Insert the total percent of hours worked for the project as a whole in each category.

#### <u>Notes</u>

Note #1: Complete two Monthly Project Reports per project. Do not list more than one project on one report.

- a) One Workforce Monthly Project Report should list all data for the Contractor.
- b) A separate Monthly Project Report should list all data consolidated for the subcontractors on the project.

**Note #2**: Contractors are required to submit four workforce forms required per month - (see instructions for Company-Wide Report for additional 2 forms:

- a.) Contractors Monthly *Project* Report (Form No.: 00485.02);
- b.) Subcontractors' Monthly *Project* Report (Form No.: 00485.02);
- c.) Contractor's Monthly Company Wide Workforce Report (Form No.: 00485.03); and
- d.) Subcontractors' Monthly Company Wide Workforce Report (Form No.: 00485.03).

**Note #3**: The last Workforce Monthly Project Reports and Workforce Monthly Company-Wide Reports will also serve as the final report. The "Yes" box should be checked in the Final Cumulative Report cell.

\* Self Calculating Cell

		Со	mpan	y-Wide	e Work	force	Mon	thly R	epor	t				
Human Relations Departme							of Kansas City, Missouri							
Report Date:			Reporting I	Period:				Contract Awarded Date:						
Contractor: City Vendor ID:														
Contact Person/Phone:		Contractor	Address:				Contracto	r Report		Subcontra	Subcontractor Report			
E-mail Address:				nired any new	/ Yes		#:	Final Cumulative Report:			Yes N			0
	construction workers this month?			No No										
Report total of all hours of work per	formed company-wide on all p	rojects in the	KCMO Metrop	olitan Statistical	Area (MSA). Er	Area (MSA). Enter the total ho		ines and in all columns.		Workforce hours should be		e based on payroll records.		
JOB CATEGORIES	OVERALL TOTAL (Sum of all Columns, A thru F Male & Female) M		A Hours Total mployees Black Er		B ( Hours Total mployees Hisp Empl		Hours Total anic Asian byees Isla F M		D I Hours Tot I/Pacific Nativi ander Er F M		E Hours American loyee F	F Total Hours Other/Unknown Race Employee M F		G KCMO Resident Hours Total #
Foreman/Supervisor														
Asbestos Worker Journeyman														
Asbestos Worker Apprentice														
Boilermaker Journeyman														
Boilermaker Apprentice														
Bricklayer Journeyman														
Bricklayer Apprentice														
Carpenter Journeyman														
Cement Mason														
Cement Mason Apprentice														
Electrician Journeyman														
Electrician Apprentice														
Elevator Constructor Journeyman														
Elevator Constructor														
Glazier Journeyman														
Glazier Apprentice														
Iron Worker Journeyman														
Iron Worker Apprentice														
Laborer Journeyman														
Laborer Apprentice														
Operating Engineer Journeyman														
Operating Engineer Apprentice														
Painter Journeyman														
Painter Apprentice														
Pipe Fitter/Plumber Journeyman														
Pipe Fitter/Plumber Apprentice														
Plasterer Journeyman														
Plasterer Apprentice														
Roofer Journeyman														
Roofer Apprentice														
Sheet Metal Apprentice														
Sprinkler Fitter														
Sprinkler Fitter Apprentice														
Truck Driver Journeyman														
Truck Driver Apprentice														
Welder Journeyman														
Other														
Total Monthly Hours														-
Total % of Hours														
Contractor shall submit report by the	e 15th of each month.			1	1		Report Cul	hmitted Pur				L		
414 E. 12th Street, 4th Floor, Kans	as City, MO 64106	<u> </u>					Neport Sul	onniceu by:			[			<u> </u>
Phone: 816-513-1836 Email	HRDcontractcompliance@kci	mo.org		Date:										
### City of Kansas City, Missouri **Human Relations Department Construction Contractor Employee Identification Report**

Company Name:	Prime's Name:	
Company Address:	KCMO Project Name:	
Company City, State, Zip:	KCMO Project Number:	
Name of Person Completing Report:	Today's Date:	
Phone Number:		
Email:	City Department:	
Instructions:		

1) Each applicable Prime Contractors must complete this form for its company within 48 hours of bid opening

- 2) The Human Relations 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 in the center titled "What are you looking for?". Type in the "What are you looking for?" field Contract Central. 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.
- Complete this form with data from your current construction workforce (no office personnel). 5)
- Prime contractor is responsible to ensure subcontractor completes this form as required in #3 above. 6)

Ojju	ciai Ose Oniy											
,	Comoloo	KCMO Resident	Malaa		KCMO Resident		I	Annuautica			Iourneyman	Apprentice
- 1	African American	0 0	African American	#######	0	Foreman/Supervisor	0	Apprenuce	Operating Engin	veer	0	0
	Asian/Pacific Islander American	0 0	Asian/Pacific Islander American	#######	0	Asbestos Worker	0	0	Painter		0	0
(	Caucasian American	0 0	Caucasian American	#######	0	Boilermaker	0	0	Pipe Fitter/Plum	ber	0	0
1	Hispanic/Latino American	0 0	Hispanic/Latino American	#######	0	Bricklayer	0	0	Plasterer		0	0
1	Native American	0 0	Native American	#######	0	Carpenter	0	0	Roofer		0	0
(	Other	0 0	Other	######	0	Cement Mason	0	0	Sheet Metal		0	0
		0 0		#######	0	Electrician	0	0	Sprinkler Fitter		0	0
						Elevator Constructor	0	0	Truck Driver		0	0
			Number of KCMO Residents	0		Glazier	0	0	Welder		0	0
			Number of Journeyman	0		Iron Worker	0	0	Other		0	
			Number of Apprentice	0		Laborer		0	-		0	0
							0	0				
	Company Name:	0		KC	CMO Project Name:	0		K	CMO Project	Number:	0	
	Name	e	Iob Title (use door down w	)	Address	City	State	Zip	КСМО	Gender	Fth	nicity
	Last	First	<b>300 THE (</b> <i>use arop uown m</i>	enu j	i iuui coo	Chy	State	Code	Resident	Genuer	Eth	incity
1												
2												
3												
4												
5												
6												
7												
8												
0												
9												
10												
11												
12												
13												
14												
15												
16												

0

	Name	e					Zip	ксмо		
	Last	First	Job Title (use drop down menu)	Address	City	State	Code	Resident	Gender	Ethnicity
17										
18										
19										
20										
20										
21										
22										
23										
24										
25										
20										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
49										
50										
51										

0

	Name	2			C'	<u>.</u>	Zip	ксмо		
	Last	First	JOD TITLE (use drop down menu)	Address	Спу	State	Code	Resident	Gender	Ethnicity
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										
62										
63										
64										
65										
66										
67										
68										
69										
70										
71										
72										
73										
74										
75										
76										
77										
78										
79										
80										
81										
82										
83										

CITY OF FOUNTAINS HEART OF THE NATION	<b>AFFIDAVIT OF TRAINING PROGRAM</b> This form must be submitted with 48 hours of Bid Opening
`\\\\	Bidder
KANSAS CITY MISSOURI	Project Title and Number Birmingham Pump Station Screen Replacement 81000928
STATE OF MISSOUR	) ) ss:
COUNTY OF	)
After being duly sworn	the person whose name and signature appears below hereby states under penalty of perjury that:
<ol> <li>I am the duly an Bidder.</li> <li>Bidder certifies industry an</li> </ol>	uthorized officer of the business indicated above ("Bidder") and I make this affidavit on behalf of that it presently participates in a training program that facilitates entry into the construction d which may include an on-the-job or in-house training program, further described as follows:
2 If requested by	(attach additional pages, if necessary)
<ol> <li>If requested by training pro</li> <li>Bidder acknow automatical</li> </ol>	gram within 48 hours of the request. edges that failure to submit this form to the City within 48 hours of the Bid Opening will ly render its bid non-responsive.
I am authorized to make	this Affidavit on behalf of the Bidder named below as:
(Title)	of (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		)	
COUNTY OF		) ss )	
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:





# **Pre Contract Bidder's Certification**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

STATE OF

COUNTY OF

) ) SS )

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 \_\_\_\_day \_\_\_\_\_.



**CONTRACT REQUIRED SUBMISSIONS** 



Project/Contract Number 81000928/1662

# Project/Contract Title/Description Birmingham Pump Station Screen Replacement

MISSOURI

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 <u>signed</u> and <u>properly dated</u> 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 <u>signed</u> and <u>properly</u> <u>dated</u> 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. <u>A power of attorney</u> issued by the Surety Company authorizing its representative to sign the Agreement must be attached to the Agreement and each copy.

<u>**CERTIFICATES OF INSURANCE**</u> [Sample form provided] <u>-</u> 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 <u>NAIC Number</u> (National Association of Insurance Commissioners) or <u>A.M. Best Number</u> 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 [Name of applicable City Department] [Name of Contract Administrator, Buyer, or Project Manager] [Department Address] Kansas City, Missouri [Zip Code]

□ 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 \_\_\_\_\_\_\_\_) ss 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		(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:



Missouri Department of Revenue **Project Exemption Certificate** 

# This form is to be completed and given to your contractor.

Name of Exempt Entity Issuing the Certi	ificate		N	lissouri T	ax Exemp	tion Number				
Address		City			State	ZIP Code				
E-mail Address		1				1				
Project Number	Project Begin Date (MM/D	D/YYYY)	Estimated	d Project	End Date	(MM/DD/YYYY)				
Description of Project			1							
Project Location			Certificat	e Expirati	on Date (I	MM/DD/YYYY)				
Provide a signed copy of this certificat Letter to each contractor or subcontractor responsibility of the exempt entity to ensi- certificate if any of the information change	te, along with a copy of the ctor who will be purchasing sure the validity of the inform ges.	e exempt entit tangible perso ation on the ce	ry's Missou onal prope ertificate. T	uri Sales rty for us he exem	and Use se in this pt entity m	Tax Exemption project. It is the pust issue a new				
Signature of Authorized Exempt Entity	Printed Name of A	uthorized Exer	npt Entity	Date (	MM/DD/Y` _ /	YYY) /				
The Missouri exempt entity named abor incorporated or consumed in the constr penalties of perjury, I declare that the ab	The Missouri exempt entity named above hereby authorizes the purchase, without sales tax, of tangible personal property to be incorporated or consumed in the construction project identified herein and no other, pursuant to <u>Section 144.062, RSMo</u> . Under penalties of periupy I declare that the above information and any attached supplement is true, complete, and correct									
Name of Purchasing Contractor	Signature of Contra	actor		Date (N	IM/DD/YY /	YY) /				
Address		City			State	ZIP Code				
Contractors - Present this to your suppl portion if extending the certificate to	lier in order to purchase the r o your subcontractor. The co	ecessary mate	erials tax e sign the for	exempt. C rm in the	complete tl space pro	ne Subcontractor vided below.				
Name of Purchasing Subcontractor										
Address		City			State	ZIP Code				
Signature of Contractor	Contractor's Printe	d Name		Date (	MM/DD/Y _/	YYY) /				

Form 5060 (Revised 08-2015)

Taxation Division P.O Box 358 Jefferson City, MO 65105-0358 Phone: (573) 751-2836 Fax: (573) 522-1271 E-mail: <u>salestaxexemptions@dor.mo.gov</u>



# 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

(016030)

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 Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_ as \_\_\_\_\_, us PRINCIPAL (CONTRACTOR), and \_\_\_\_\_ 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 municipal corporation, (OWNER), as obligee, in the penal sum of chartered 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/Contract Numbers 81000928/1662. Birmingham Pump Station Screen Replacement. 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 iudicial 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:

Dy		
Title:		
Date:		

(Attach seal and Power of Attorney)





# **PAYMENT BOND**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_

as b do

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/Contract Numbers 81000928/1662, Birmingham Pump Station Screen Replacement**, 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)

ACORD CERI	٦F	IC	ATE OF LIA	BILITY	INSURA	NCE	DATE	(MM/DDMYYY)			
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			CONTACT NAME:								
AGENT NAME AND ADDRESS		PHONE FAX (A/C, No):									
				E-MAIL ADDRESS:		3754					
						NAIC #					
		INSURER A : ABC INSURANCE COMPANY									
INSURED	INSURER B :										
CONTRACTOR NAME AND ADDRESS	INSURER C :										
				INSURER D :							
				INSURER E :							
	-			INSURER F :			0.2				
		CATE	ENUMBER:			REVISION NUMBER:		IOV DEDIOD			
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	SUBR	POLICY NUMBER	POLICY E	FF POLICY EXP	LIM	ITS				
GENERAL LIABILITY				1000		EACH OCCURRENCE	\$ 1,00	00,000			
	Y	Y	POLICY NUMBER	1/1/201	1 Current	DAMAGE TO RENTED PREMISES (Ea occurrence)	\$ 50,0	000			
CLAIMS-MADE 🖌 OCCUR				1		MED EXP (Any one person)	\$ 10,0	000			
						PERSONAL & ADV INJURY	\$ 1,000,000				
						GENERAL AGGREGATE	\$ 2,00	00,000			
GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGO	GG \$ 2,000,000				
POLICY PRO- JECT LOC		1					\$				
				110-5°		(Ea accident)	s 1,00	00,000			
		Y Y	POLICY NUMBER	1/1/2011	Current	BODILY INJURY (Per person)	\$				
AUTOS AUTOS						BODILY INJURY (Per acciden	t) \$	-			
HIRED AUTOS						(Per accident)	\$				
		-				· · · · · · · · · · · · · · · · · · ·	\$				
	Y	Y	POLICY NUMBER	1/1/201	1 Current	EACH OCCURRENCE	\$ 2,00	0,000			
						AGGREGATE	\$ 2,00	00,000			
WORKERS COMPENSATION	-					WC STATU- OTH	<u>\$</u>  -				
OFFICER/MEMBER EXCLUDED?	N/A	Y	POLICY NUMBER	1/1/201	1 Current		5 1.0	000,000			
If yes, describe under						EL DISEASE - POLICY LIMI		00,000			
A Leased/Rented/Equip. Owned Equipment	N/A	Y	POLICY NUMBER	1/1/201	1 Current	Limit; Deductible Limit; Deductible		20,000			
DESCRIPTION OF OPERATIONS / LOCATIONS / VEHIC	LES (	Attach	ACORD 101, Additional Remarks S	Schedule, if more spa	ace is required)	I-Entries Preventione					
Project No. [Title]. Cert	holde	er (Cif	v) and	Desian Professio	onal) and any oth	er entities named in 008	00 SCs a	are named			
					aleration and so and so and so			and			
as primary, noncontributing Additional Historicus including products and completed operations, excluding workers compensation, employers liability and											
professional nability. Warver of sublogation applies as anowed by law. The policies required above shall contain no exclusions for work expressly within the											
subcontractors scope of work.]											
CERTIFICATE HOLDER				CANCELLATI	ON						
City of Kansas City, Missouri [Department]				SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.							
Kansas City, MO [Zip]											
L			All and a second s	C	91988-2010 AC	ORD CORPORATION.	All rig	hts reserved.			

The ACORD name and logo are registered marks of ACORD

AUTHORIZATION TO RELEASE					
Α					
<b>REVENUE CLEARANCE LETTER</b>					

Revenue Division

414 East 12<sup>th</sup> Street, 2<sup>nd</sup> 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 Cit Revenue Clearance Letter for:	ty, Missouri, Financ	e Department	t, Revenue Div	vision, to release a						
Name of Taxpayer:		Tax	I.D.#							
Address:	(PRINT)									
				· · · · · · · · · · · · · · · · · · ·						
Check this box and the City will send the Clearance Letter to you or the contractor										
Lesignated.										
NAME (PRINT)	BUSINESS NAME TITLE									
ADDRESS		CITY, STATE, ZIP CODE								
PHONE NUMBER	FAX NUMBER		E-MAIL ADDR	ESS						
	-									
☐ I authorize the City to pr	ovide the Taxpa	ver's Reveni	Je Clearance	e 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 1 <sup>st</sup> Revenue Clearance Letter to:										
	(Print	Name of City Depar	tment/Contact Perso	n/E-mail/Fax Number)						
This authorization shall expire one (1) y	ear from the date of th	e 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 (//	TITLE (IF APPLICABLE)								
SIGNATURE		PHONE	NUMBER	DATE						

# A FACSIMILE OF THIS DOCUMENT SHALL CONSTITUTE AN ORIGINAL

Date

Telephone Fax

Company Name ; With D.B.A. Name Address City, State, Zip

Tax payer ID: Nine digit ID Number

Attn:

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.

**Commissioner of Revenue** 

By:\_\_\_\_\_\_ Signature

Representatives Name and Title

# **IMPORTANT INFORMATION:**

Due to the confidential nature of tax information, this notice is provided directly to the taxpayer.

If you are working on or have a contract with the City of Kansas City, Missouri, a copy of this clearance letter will need to be provided to the contracting department, In accordance with Manual of Instruction 4-1, Article VII, Section B, for City contractors and subcontractors, the clearance letter must be dated not more than sixty (60) days: (1) before a bidder is provided written notice of intent to contract by the City, (2) before a subcontractor begins work, (3) before the filing of an application for final payment to a contractor, and (4) before the date of a contractor's final payment to a subcontractor.





# ARTICLE 1 DEFINITIONS AND TERMINOLOGY

- 1.01 Defined Terms
- 1.02 Terminology

# **ARTICLE 2 PRELIMINARY MATTERS**

- 2.01 Delivery of Bonds
- 2.02 Evidence of Insurance
- 2.03 Copies of Documents
- 2.04 Commencement of Contract Times; Notice to Proceed
- 2.05 Starting the Work
- 2.06 Before Starting Construction
- 2.07 Initially Acceptable Schedules

# ARTICLE 3 CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

- 3.01 Intent
- 3.02 Reference to Standards and Specifications of Technical Societies
- 3.03 Reporting and Resolving Discrepancies
- 3.04 Amending and Supplementing Contract Documents
- 3.05 Reuse of Documents

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

- 4.01 Availability of Lands
- 4.02 Subsurface and Physical Conditions
- 4.03 Differing Subsurface or Physical Conditions
- 4.04. Physical Conditions Underground Facilities
- 4.05 Reference Points
- 4.06 Asbestos, Lead-Based Paint, PCBs, Petroleum, Hazardous Waste or Radioactive Material

# **ARTICLE 5 BONDS AND INSURANCE**

- 5.01 Performance, Payment and Other Bonds
- 5.02 Licensed Sureties and Insurers
- 5.03 Certificates of Insurance
- 5.04 CONTRACTOR's Liability Insurance
- 5.05 CITY's Liability Insurance
- 5.06 Property Insurance
- 5.07 Waiver of Rights
- 5.08 Receipt and Application of Insurance Proceeds
- 5.09 Partial Utilization Property Insurance

# **ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES**

- 6.01 Indemnification
- 6.02 Supervision and Superintendence

- 6.03 Services, Working Hours, Labor, Materials and Equipment
- 6.04 Progress Schedule
- 6.05 Recovery Schedules
- 6.06 Substitutes and "Or-Equal" Items
- 6.07 Concerning Subcontractors, Suppliers and Others
- 6.08 Patent Fees and Royalties
- 6.09 Permits
- 6.10 Laws or Regulations
- 6.11 Taxes
- 6.12 Use of Site and Other Areas
- 6.13 Record Documents
- 6.14 Safety and Protection
- 6.15 Safety Representative
- 6.16 Hazard Communication Programs
- 6.17 Emergencies
- 6.18 Shop Drawings and Samples
- 6.19 Continuing the Work
- 6.20 CONTRACTOR's General Warranty and Guarantee

# **ARTICLE 7 OTHER WORK**

- 7.01 Related Work at Site
- 7.02 Coordination

# **ARTICLE 8 CITY's RESPONSIBILITIES**

- 8.01 Communications to CONTRACTOR
- 8.02 Replacement of DESIGN PROFESSIONAL
- 8.03 Furnish Data and Prompt Payment
- 8.04 Lands and Easements; Reports and Tests
- 8.05 Insurance
- 8.06 Change Orders
- 8.07 Inspections, Tests and Approvals
- 8.08 Limitations on CITY's Responsibilities
- 8.09 Undisclosed Hazardous Environmental Condition
- 8.10 Evidence of Financial Arrangements
- 8.11 CITY's Representative
- 8.12 Visits to Site

# **ARTICLE 9 DESIGN PROFESSIONAL'S STATUS DURING CONSTRUCTION**

- 9.01 General Scope of DESIGN PROFESSIONAL's Duties
- 9.02 Resident Project Representative
- 9.03 Clarifications and Interpretations
- 9.04 Rejecting Defective Work
- 9.05 Shop Drawings, Change Orders and Payments
- 9.06 Determinations for Unit Prices
- 9.07 Decisions on Requirements of Contract Documents and Acceptability of Work
- 9.08 Limitations on DESIGN PROFESSIONAL's Authority and Responsibilities

# ARTICLE 10 CHANGES IN THE WORK

- 10.01 Authorized Changes in the Work
- 10.02 Unauthorized Changes in the Work
- 10.03 Execution of Change Orders
- 10.04 Notification to Surety

# **ARTICLE 11 CHANGE OF CONTRACT PRICE**

- 11.01 Change of Contract Price
- 11.02 Cost of the Work
- 11.03 Cash Allowances
- 11.04 Unit Price Work
- 11.05 Dispute Resolution

# **ARTICLE 12 CONTRACT TIMES**

- 12.01 Time of the Essence
- 12.02 Change of Contract Times
- 12.03 Proof Required To Justify An Extension of Time For Excusable and Compensable Delays
- 12.04 Delays Within CONTRACTOR's Control
- 12.05 Delays Beyond the CITY's and CONTRACTOR's Control
- 12.06 Delay Damages
- 12.07 Dispute Resolution

# ARTICLE 13 TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

- 13.01 Access to Work
- 13.02 Tests and Inspections
- 13.03 Notice of Defects
- 13.04 Uncovering Work
- 13.05 CITY May Stop the Work
- 13.06 Correction or Removal of Defective Work
- 13.07 Correction Period
- 13.08 Acceptance of Defective Work
- 13.09 CITY May Correct Defective Work

# **ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION**

- 14.01 Schedule of Values
- 14.02 Application for Progress Payments
- 14.03 Contractor's Warranty of Title
- 14.04 Substantial Completion
- 14.05 Partial Utilization
- 14.06 Final Inspection
- 14.07 Final Payment
- 14.08 Final Completion Delayed
- 14.09 Waiver of Claims
- 14.10 Completion of Work by City

### ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

- 15.01 CITY May Suspend Work
- 15.02 CITY May Terminate for Default
- 15.03 CITY May Terminate for Convenience

# **ARTICLE 16 CLAIMS AND DISPUTES**

- 16.01 Definition
- 16.02 Written Notice and Burden of Proof
- 16.03 Time Limits on Claims
- 16.04 Continuing Contract Performance
- 16.05 Injury or Damage to Person or Property
- 16.06 Initial Resolution of Claims and Disputes
- 16.07 Final Resolution of Claims and Disputes

# **ARTICLE 17 MISCELLANEOUS**

- 17.01 Giving Notice
- 17.02 Computation of Times17.03 Cumulative Remedies17.04 Survival of Obligations
- 17.05 Controlling Law

# 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 11and/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 11and/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, subconsultants, 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 the 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 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 personnel, subcontractors or suppliers as applicable and shall require all 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.

# 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 a 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, expediters, 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 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 is 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.

CITY OF FOUNTAINS Heart of the Nation



# SUPPLEMENTARY CONDITIONS

Project/Contract Numbers: <u>81000928/1662</u>

Project Title: Birmingham Pump Station Screen Replacement

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) copy of the Drawings and Specifications, including Addenda.

**SC-4.02** Article 4, Paragraph 4.02, Subsurface and Physical Conditions; Subparagraph A and B are supplemented as follows:

In the preparation of the Contract Documents, no reports of explorations or tests of subsurface conditions at or contiguous to the Site of the Work were utilized.

In the preparation of Contract Documents, the following drawings of physical conditions in or relating to existing surface or subsurface structures (except Underground Facilities) which are at or contiguous to the Site of the Work were utilized:

1. Drawings dated 1974, prepared by Black and Veatch; entitled **Contract No. 111 Birmingham Pumping Station**, which may be reviewed at upon request.

**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 have been prepared.

**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 B.1 (DELETED)

**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. DELETED
- 6. Environmental Liability Insurance. This insurance shall protect CONTRACTOR, 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, 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.

8. Deleted

# SC-5.06A (DELETED)

# SC-6.01 (DELETED)

**SC-6.03** Article 6 Services, Working Hours, Labor, Materials and Equipment, is amended by adding the following new Subparagraph 6.03 Paragraph E:

Manufactured goods, equipment, or commodities with service representatives with local offices (within the states of Kansas or Missouri) may be given preference by CITY over manufactured goods, equipment, or commodities with non-local service representatives. If there is no service representative with a local office, Contractor may procure item from outside of Kansas or Missouri. For items by non-local service representatives, a good faith effort by Bidder must be demonstrated to CITY before use.

**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 11 calendar days prior to Bid date at the following address:

Water Services Department 4800 E. 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 45 days prior to the time the item is to be incorporated into the Work. Proposed substitute items must not negatively impact project schedule unless approved by CITY. 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 B.** Article 6, Paragraph 6.07, Concerning Subcontractors, Suppliers and Others, Subparagraph B is supplemented as follows:

Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) are to be submitted to CITY for acceptance by the date of Bid.

# SC-6.07 J (DELETED)

**SC-6.09.** Article 6, Paragraph 6.09, Permits, Subparagraph A is supplemented as follows:

CONTRACTOR does not need to obtain and pay for the following construction permits and licenses, which have been paid for by CITY:

None

**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

Work Type:	State –	Heavy
	State –	Building

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

1. "Resident Laborers" means laborers who have been residents of the State of Missouri for at least thirty days and who intend to remain Missouri residents, and residents of Nonrestrictive States.

2. "Nonrestrictive States" means states identified by the Missouri Department of Labor and Industrial Relations Division of Labor Standards that have not enacted state laws restricting Missouri laborers from working on public works projects. A list of Nonrestrictive States can be found on the Division web site at <a href="http://www.dolir.mo.gov/ls/index.htm">http://www.dolir.mo.gov/ls/index.htm</a>.

3. A period of Excessive Unemployment is declared when the Missouri Department of Labor and Industrial Relations Division of Labor Standards provides notice of such declaration. When in effect, notice will be provided on the Division web site at <a href="http://www.dolir.mo.gov/ls/index.htm">http://www.dolir.mo.gov/ls/index.htm</a>. It is CONTRACTOR's obligation to determine whether a period of Excessive Unemployment is in effect when this Contract is let.

4. CONTRACTOR agrees to follow the provisions of Section 290.560 - 290.575 RSMo and agrees that if a period of Excessive Unemployment has been declared at any point during the term of this Contract, it will employ and require all Subcontractors of whatever tier to employ only Resident Laborers for the Work to be performed under this CONTRACT.

Provided, however, CONTRACTOR may use laborers who are not Resident Laborers when Resident Laborers are not available or are incapable of performing the particular type of work involved if CONTRACTOR so certifies in writing to CITY and CITY issues a written approval. This provision does not apply to regularly employed nonresident executive, supervisory or technical employees.

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-6.20** Article 6, CONTRACTOR's General Warranty and Guarantee, is amended by adding the follow new Subparagraph 6.20 D.

Contractor's warranty period shall be extended to any manufactured good, equipment, or commodities procured by Contractor. If Original Equipment Manufacturer (OEM) warranty has a shorter warranty period than Contractor's warranty period with CITY per the Contract, Contractor shall be responsible for fixing, repairing, and replacing defective Work or equipment item at no cost to CITY.

# SC-6.22 (NOT APPLICABLE)

**SC-7.02 A.** Article 7, Paragraph 7.02, Coordination, Subparagraph A is supplemented as follows:

- It is anticipated that work under separate contracts will be performed at the Site, concurrent with the Work to be performed pursuant to these Contract Documents. The following person, firm or corporation ("the Coordinating Contractor") will have authority and responsibility for coordination of the activities among the various contractors performing work at the Site: (The awarded Bidder of this Contract).
- 2. NOT APPLICABLE
- 3. NOT APPLICABLE
- 4. NOT APPLICABLE

**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: TBD

**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): Lion CSG LLC.

Resident Project representative: To Be Determined.

Assistant(s) to the resident Project representative: To Be Determined.

**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 Water Services, and the Work shall be substantially complete, in accordance with Paragraph 14.04, within 540 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 60 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 (\$2,000.00) 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.2, CONTRACTOR shall pay to CITY the amount of Five Hundred (\$500.00) 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 three (3) 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-14.02 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 a mutually agreed upon day 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.

- 4. After 50% of the contract amount has been invoiced, the following conditions must be met for continued progress payments.
  - All materials shall be reviewed and accepted by Engineer.
  - Payments are not less than six (6) weeks prior to the provision of training.
- 5. Contractor must provide submittals as required by Contract documents. Additionally, for each listed equipment item, Contractor shall have all training materials approved and training scheduled prior to billing for more than 80% of value for the equipment.
- 6. If a commissioning plan is not approved prior to 50% of the contract value being invoiced, the project retainage on all future payments shall be 10% for that payment application's value.

**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:
  - Pump Station including all associated equipment and structures
  - All Work Associated with Accepted Allowances
  - All Work Associated with Accepted Alternates

**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:

2. 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.

# SC-17. (Deleted)

# Missouri Division of Labor Standards WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

# Annual Wage Order No. 29

# 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, 2022

Last Date Objections May Be Filed: April 11, 2022

Prepared by Missouri Department of Labor and Industrial Relations

#### Building Construction Rates for CLAY County

	**Prevailing
OCCUPATIONAL TITLE	Hourly
	Rate
Asbestos Worker	\$66.22
Boilermaker	\$31.44*
Bricklayer	\$59.38
Carpenter	\$59.64
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$54.27
Plasterer	
Communications Technician	\$55.20
Electrician (Inside Wireman)	\$65.94
Electrician Outside Lineman	\$31.44*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$31,44*
Glazier	\$31.44*
Ironworker	\$66.41
Laborer	\$47.56
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$54.19
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$60.02
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$49.94
Plumber	\$73.63
Pipe Fitter	
Roofer	\$57.74
Sheet Metal Worker	\$71.49
Sprinkler Fitter	\$31.44*
Truck Driver	\$31.44*
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 Section 290.210 RSMo.

#### Heavy Construction Rates for CLAY County

	**Prevailing
OCCUPATIONAL TITLE	Hourly
	Rate
Carpenter	\$57.92
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$31.44*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$49.24
General Laborer	
Skilled Laborer	
Operating Engineer	\$57.18
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$49.61
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. 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 Section 290,210 RSMo.

# 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.





CITY OF FOUNTAINS

Project Number <u>81000928/1662</u>

Project Title Birmingham Pump Station Screen Replacement

[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 <u>not</u> 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.

CITY OF FOUNTAINS Heart of the Nation			
	REQUEST F		ΓΙΟΝ
Ч IIII <i>У</i>	Project Number <u>8100</u>	00928/1662	
Project Title Birmingham Pump Station Screen Replacement			
KANSAS CITY MISSOURI	Contractor		
	RFI Number	Date	
From:			
To:			
Ke			
Spec. Sec. Ref:	Paragraph:	Drawing Ref:	Detail:
•	0 1	U U	
0.			
Signed: Response:			
Attachments			
Response From:	To:	Date Transmitted:	Date Rec'd:
Signed <sup>.</sup>		Signed <sup>.</sup>	
Design Professiona		Owner's Representat	live
Distribution: Owner			
	ruction Manager		
	n Professional		
Consu Other			





# **REQUEST FOR INTERPRETATION LOG**

Project Number <u>81000928/1662</u>

Project Title Birmingham Pump Station Screen Replacement

CONTRACTOR \_\_\_\_\_

OWNER \_\_\_\_\_

RFI No.	Issue Date	Brief Description of issue and response	Respond Date



	SUPPLEMENT	AL DESIGN INS	TRUCTION	
Ч IIII <i>У</i>	Project Number <u>8100092</u>	8/1662		
ų p	Project Title <u>Birmingham</u>	Pump Station Screen Rep	lacement	
KANSAS CITY MISSOURI	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

Distribution: Downer

Contractor

Construction Manager

Design Professional

Consultant \_\_\_\_\_ Other \_\_\_\_ Date



# **REQUEST FOR PROPOSAL**

Project Number <u>81000928/1662</u>

ų įj	Project Title <u>Birmingham Pump Station Screen Replacement</u>			
KANSAS CITY MISSOURI	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 \_\_\_\_\_





# **REQUEST FOR PROPOSAL LOG**

Project Number <u>81000928/1662</u>

Project Title Birmingham Pump Station Screen Replacement

CONTRACTOR \_\_\_\_\_

OWNER \_\_\_\_\_

RFP No.	Issue Date	Brief Description of Request	Respond Date	Amount	CO No.

#### CITY OF FOUNTAINS Heart of the Nation



KANSAS CITY MISSOURI

# **CHANGE ORDER**

Project Number	81000928/1662
Project Title	Birmingham Pump Station Screen Replacement
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]

[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 ( $\Box$ increased by) ( $\Box$ decreased by) ( $\Box$ 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 ( $\Box$ increased by) ( $\Box$ decreased by) ( $\Box$ 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	
	nue.	

CONTRACTOR:	By:	Date:
	Title	
CITY.	By	Date <sup>.</sup>
	-}	54101
	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.

By:				
Director of Finance		Date		
<b>B</b>				
Distribution:				
	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 81000928/1662

Project Title Birmingham Pump Station Screen Replacement

Date of Issuance:

No.:

#### 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:								
<ul> <li>Unit Prices</li> <li>Lump Sum</li> <li>As Stipulated in General Conditions</li> <li>Other</li> </ul>			CONTRACTOR's Records								
			<ul> <li>DESIGN PROFESSIONAL's Records</li> <li>City's Records</li> <li>Other</li> </ul>								
							Estimated increase (decrease) in Contract Price:		Estimated increase (decrease) in Contract Times:		
							\$			Substantial Completion:	
If the change involves an increase, the estimated Amount is not to be exceeded without further		Final Completion:		days.							
		If the change involves an increase, the estimated times are not to be exceeded without further authorization.									
authorization.											
Recommended:		Recommended:		Recommended:							
DESI	GN PROFESSIONAL	Construct	ion Manager	City							
By (Authorized Signature) By		By (Authori	zed Signature)	By (Authorized Signature)	)						
Distribution:	<ul> <li>City</li> <li>Contractor</li> <li>Construction Manager</li> </ul>		Design Professional Consultant Other								

#### [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 01000 – GENERAL PROJECT REQUIREMENTS

# PART 1 - GENERAL

# 1.01 SUMMARY

- A. This section covers the general project requirements for all projects.
- B. The work to be performed under these Contract Documents shall be consistent with Section 0700-General Conditions in the construction, installation, and completion of all work required in connection with the Birmingham Pump Station Screen Replacement Project, in Kansas City, Clay County, Missouri.

# 1.02 RELATED SECTIONS

- A. Section 00700 General Conditions.
- B. Section 00800 Supplementary Conditions.
- C. Section 01020 Record Documents.
- D. Section 01300 Submittals.
- E. Section 01329 Safety Plan
- F. Section 01352 Selective Alterations and Demolition
- G. Section 01566 Cleanup Operations.
- H. Section 01570 Temporary Erosion Control.
- I. Section 01580 Project Signs.
- J. Section 01581 Public Communications.
- K. Section 02300 Earthwork.

# 1.03 CODES AND STANDARDS

A. By reference, as applicable for the Work being performed.

#### 1.04 SUBMITTALS

- A. Submit as specified in Section 01300 Submittals.
- B. Project Communications:
  - 1. Progress Meeting Minutes.
- C. Other:
  - 1. Description and location of offsite storage arrangements.
  - 2. Construction Site Plan.
  - 3. Safety Representative.

# 1.05 QUALITY ASSURANCE

A. The Contractor or Design-Builder is responsible for the quality assurance and quality control of the Work.

# MATERIALS SELECTION AND ACQUISITION

- A. The Contractor or Design-Builder shall not use materials or equipment removed from existing premises, except as specifically permitted by the Contract Documents. All products shall be new, never used before, unless otherwise specified.
- B. Provide interchangeable components of the same manufacturer, for similar removable components, such as: T-bolts, glands, gaskets, manhole rings and covers, nuts, wiring, slip rings, conduit, bolts, seals, etc.

1.06

### 1.07 CONSTRUCTION SITE PLAN

- A. The Contractor shall submit a site plan showing the locations and dimensions of temporary facilities which include, but are not limited to, the following layouts and details:
  - 1. Equipment and material storage area on City property and bonded warehouses).
  - 2. Access and traffic routes.
  - 3. Indicate if a supplemental or off-site staging area is being utilized.
  - 4. Show locations of safety and construction fencing, job site trailer, construction entrances, trash dumpsters, temporary sanitary facilities and parking areas for project personnel.
  - 5. Indicate locations of concrete washout facilities.

# 1.08 EASEMENTS AND RIGHTS-OF-WAY

- A. The City will furnish the Site in accordance with Section 00700 General Conditions. The Contractor or Design-Builder shall confine construction operations to the immediate vicinity of the Site shown in the Contract Documents and shall use due care in placing construction tools, equipment, excavated materials, construction materials and supplies to cause the least possible damage to public and private property and least possible interference with public traffic.
- B. On Private Property:
  - 1. The permanent easements are as noted in the Contract Documents. No additional temporary construction easements have been obtained, unless otherwise indicated in the Contract Documents. The Contractor or Design-Builder 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 or Design-Builder shall remove all construction stakes.
  - 2. The Contractor or Design-Builder shall not enter any private property outside the designated construction easement boundaries without written permission from the owner of the property and notification to the RPR
  - 3. 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 or Design-Builder shall obtain a written agreement with each affected property owner and tenant. Each agreement shall clearly outline the terms for which the Contractor or Design-Builder may utilize the property and shall be fully executed by the Contractor or Design-Builder, the property owner and the tenant (when applicable).
  - 4. Whenever the easement is occupied by crops which will be damaged by construction operations, the Contractor or Design-Builder shall notify the property owner sufficiently in advance so that the crops may be removed before the Work is started. The Contractor is responsible for all damage to crops outside the easement and shall make satisfactory settlement for the damage directly with the property owner.
  - 5. Where the Work impacts fields that are leveled for irrigation or terraced, the Contractor shall relevel irrigated fields and replace all terraces to their original or better condition and to the satisfaction of the property owner.

01000 - 2 of 12 Revised 05-08-20 Kansas City, Missouri Water Services Department Standard Specification

- C. State Highways:
  - 1. All work within MoDOT right-of-way shall be in conformance with MoDOT regulations. The permit must be secured before any construction is started within MoDOT right-of-way.

# 1.09 LINES AND GRADES

- A. All Work shall be done to the lines, grades and elevations indicated in the Contract Documents.
- B. Basic horizontal and vertical control points are provided in the Contract Documents. All additional survey, layout and measurement work shall be performed by the Contractor or Design-Builder as a part of the Work.
- C. The Contractor or Design-Builder shall provide an experienced surveyor, competent assistants and all instruments, tools, stakes and other materials required to complete the survey, layout and measurement work.
- D. The Contractor or Design-Builder shall provide qualified personnel, materials and equipment (tools, stakes and other materials) as may be required for the following tasks needed in the Work:
  - 1. Establish or designate control points.
  - 2. Establish construction easement boundaries.
  - 3. Verify survey.
  - 4. Verify layout shown on the Contract Documents.
  - 5. Verify and document work performed by the Contractor or Design-Builder. These efforts shall be included in the Contractor or Design-Builder's bid price and performed at no additional cost to the City.
- E. The Contractor or Design-Builder shall remove and reconstruct, at no additional cost to the City, any Work that was improperly installed or improperly located.
- F. See Section 01020 Record Documents, paragraph SURVEY REQUIREMENTS for additional requirements.

# 1.10 CONNECTIONS TO EXISTING FACILITIES

- A. Unless otherwise specified or indicated in the drawings, the Contractor or Design-Builder shall make all necessary connections to existing facilities. This includes, but is not limited to, structures, drain lines, water utilities, sewer utilities, gas utilities, communications utilities and electric utilities. In each case, the Contractor or Design-Builder shall receive permission from the City or the owning utility prior to undertaking a connection or disconnection. The Contractor or Design-Builder shall protect facilities against deleterious substances and damage.
- B. Connections to existing facilities that are in service shall be thoroughly planned in advance. See 01140, 01140.01 01140.02 All required equipment, material and labor shall be on hand at the time of undertaking the connections.

# 1.11 UNFAVORABLE CONSTRUCTION CONDITIONS.

- A. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine operations to Work that will not be adversely affected by such conditions.
- B. No portion of the Work shall be constructed under conditions that would adversely affect the quality or efficiency thereof, unless special means or precautions are taken

by the Contractor or Design-Builder to perform the Work in a manner acceptable to the City.

# 1.12 UNDERGROUND FACILITIES AND ASSOCIATED RESTORATION

- A. As provided in Section 00700, paragraph 4.04 of the General Conditions, the Contractor shall perform all cutting and patching required for the Work and as may be necessary in connection with locating all underground facilities, installation of Work, uncovering Work for inspection or for the correction of defective Work.
- B. The Contractor or Design-Builder shall perform all cutting and patching required for and in connection with the Work, including but not limited to the following:
  - 1. Removal of improperly timed Work.
  - 2. Removal of samples of installed materials for testing.
  - 3. Alteration of existing facilities.
  - 4. Installation of new Work.
- C. The Contractor or Design-Builder shall provide all shoring, bracing, supports and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. The Contractor or Design-Builder shall not undertake any cutting or demolition that may affect the structural stability of the Work or existing facilities without City's approval.
- D. Materials shall be cut and removed as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. The Contractor or Design-Builder shall remove all excavated materials from the site that cannot be incorporated in the Work.
- E. All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to City, to obtain a finished installation with strength, appearance and functional capacity required to match the existing area. If necessary, entire surfaces shall be patched and refinished.
- F. The Contractor or Design-Builder, at no extra cost to the City, shall replace all surface features damaged, removed or so designated to be replaced.
- G. Contractor or Design-Builder shall at no cost provide photographic documentation of all exposed work after excavation prior to additional underground work and prior to backfill. Photos shall be taken from as many angles as possible.

# 1.13 ENVIRONMENTAL PROTECTION

- A. Laws and Regulations:
  - The Contractor or Design-Builder shall conform to all laws and regulations as required by Section 00700 – General Conditions, Article 6 – Contractor or Design-Builder's Responsibilities.
- B. Storm Water Runoff:
  - Storm Water Pollution Prevention Plan (SWPPP): As required by Section 00700

     General Conditions, Article 6 Contractor or Design-Builder's Responsibilities.
  - 2. Erosion Sediment Control: See Paragraph 1.25.
  - 3. The Contractor or Design-Builder shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris and other substances resulting from construction activities. See paragraph 1.38.
  - 4. Dewatering: As required by Section 02200 Earthwork.
  - 5. Concrete Washout Facilities: As required by Section 01566 Cleanup Operations.

01000 – 4 of 12 Revised 05-08-20 Kansas City, Missouri Water Services Department Standard Specification
- C. Air Pollution:
  - 1. Burning: No open burning will be permitted.
  - 2. Dust Control: See paragraph 1.37.
- D. Other Construction Activities:
  - 1. Disposal of Demolition Material: As required by Section 01352 Selective Alterations and Demolition.
  - 2. Protection of Wetlands: As shown on the Drawings or Section 01140 Work Restrictions
  - 3. Floodplains: As shown on the Drawings or Section 01140 Work Restrictions
  - 4. Cleanup and Site Maintenance: As required by Section 01566 Cleanup Operations.

#### 1.14 LICENSES, PERMITS, AND CERTIFICATES

- A. Requirements for licenses, permits and certificates are provided in Section 00700 General Conditions, paragraph 6.09.
- B. Permitting exceptions (if any) are noted in Section 00800 Supplementary Conditions.

#### 1.15 APPLICABLE CODES

A. Standard specifications of the Kansas City, Missouri Department of Public Works are, by reference, hereby made a part of this contract specifications

#### 1.16 REFERENCE STANDARDS

A. See Section 00700 – General Conditions, paragraph 3.02 for references to standards and specifications of technical societies.

#### 1.17 PRECONSTRUCTION CONFERENCE

- A. A Preconstruction Conference will be held in accordance with Article 2 of the General Conditions. The conference will be held at a mutually agreed time and location. The conference shall be attended by:
  - 1. Contractor or Design-Builder and the project superintendent(s).
  - 2. Design Professional(s) (Engineer of Record) and Owner's Advisor if applicable
  - 3. Resident Project Representative(s).
  - 4. City's Representative
  - 5. Other City Staff (Engineering, Operations, etc...)
- B. Other participants as requested by the Contractor, Design-Builder, or City; such as the following:
  - 1. Principal Subcontractors such as Systems Integrator, Electrical, shoring, Mechanical, concrete etc..
  - 2. Representative of principal suppliers and manufacturers as appropriate.
  - 3. Utility Company representatives.
  - 4. Affected Property Owners and other stakeholders
  - 5. Governmental representatives as appropriate.
  - 6. The Contractor or Design-Builder shall bring to the conference the Preliminary Schedules described in Article 2 of the General Conditions (Preliminary Project Schedule, Preliminary Schedule of Values, Preliminary Schedule of Shop Drawings and Samples), major outages, OCCPs, suggested communication routes, a draft risk register, and list of project goals.

- C. The purpose of the conference is to designate responsible personnel and to establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda shall include, but not limited to, the following:
  - 1. Contractor or Design-Builder's Preliminary Schedules.
  - 2. Document Management
  - 3. Timing the Monthly Schedule Update
  - 4. Processing Applications for Payment.
  - 5. Commissioning Plan including the Commissioning Manager
  - 6. Maintaining record documents
  - 7. electronic data requirements including Electronic O&M manuals and BIM (if applicable)
  - 8. Critical Work sequences
  - 9. Field decisions and Change Orders.
  - 10. Use of premises, field office, material storage areas, security, housekeeping, and City's needs.
  - 11. Major equipment deliveries and priorities.
  - 12. Contractor or Design-Builder's assignment for Safety Representative.
  - 13. Discussion of the Safety Plan (See Section 01329 Safety Plan)
  - 14. Expectations and the Contractor or Design-Builder's plan for Environmental Protection.
- D. Contractor or Design-Builder will preside at the conference, will arrange for keeping the minutes and will distribute draft minutes to all persons in attendance within one business day.

## 1.18 PROGRESS MEETINGS

- A. The Contractor or Design-Builder shall schedule and hold progress meetings weekly unless mutual agreed upon, and, at other times as requested by the City or as needed by the progress of the Work. The duration of the weekly meetings will mutually agree upon by the City and Contractor or Design-Builder The Contractor or Design-Builder, City, Design Professional, and all Subcontractors active on the Site shall be represented at each meeting. The Contractor or Design-Builder may, at their discretion, request attendance of their suppliers, manufacturers or other utilities.
- B. The Contractor or Design-Builder shall preside at the meeting. Meeting minutes shall be prepared and distributed by the Contractor or Design-Builder after review by the City or Design Professional. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling and resolve problems which may have developed on the project.
- C. Draft meeting minutes will be distributed within one business day.

# 1.19 SAFETY REPRESENTIVE

- A. In accordance with Section 00700 General Conditions, Article 6 Contractor or Design-Builder's Responsibilities, the Contractor or Design-Builder shall submit the name and complete contact information for the person designated as the Safety Representative for the Project.
- B. In accordance with Section 01300 Submittals, This information shall be submitted prior to the Preconstruction Conference.

C. If the Safety Representative changes during the Project, the Contractor or Design-Builder shall designate a new person to fulfill the role and submit their name and complete contact information.

#### 1.20 SAEFTY PLAN

A. See Section 01329 – Safety Plan.

#### 1.21 SITE ADMINISTRATION

A. The Contractor or Design-Builder is responsible for all areas of the site used by their personnel and all Subcontractors in the performance of the Work. The Contractor will 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. The Contractor or Design-Builder has 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 to observe the same regulations as their personnel.

#### 1.22 CLEAN-UP

A. The Contractor or Design-Builder shall conduct cleanup operations in accordance with Section 01566 – Project Cleanup.

#### 1.23 SUBSTANTIAL COMPLETION WALKTHROUGH

- A. See Section -00700 General Condition Article 14.04.
- B. Walkthrough will also include City Employees from the operating division as designed by their Division Manager.

#### 1.24 FINAL ACCEPTANCE

A. Final Acceptance of the Work shall be in accordance with Section 00700 – General Conditions, Article 14.

#### 1.25 EROSION AND SEDIMENT CONTROL

A. Work associated with erosion and sedimentation control shall be done in accordance with Section 01570 – Temporary Erosion and Sediment Control.

## 1.26 STREET LIGHTS AND SITE LIGHTING

A. Relocation or restoration of streetlights and Site lighting due to construction interference shall be included in the Contractor or Design-Builder's Bid Price. No separate measurement and payment will be made. The Contractor or Design-Builder shall notify and coordinate street light relocations with the Public Works Department:

Street Lights Division Phone: (816) 513-9500.

#### 1.27 PROJECT SIGNS

A. Work associated with Project signs shall be done in accordance with Section 01580 – Project Signs.

#### 1.28 RESTORATION

A. The Contractor or Design-Builder shall replace all surface material and shall restore all paving, curbs, gutters, sidewalks, driveways, shrubbery, fences, sod, walls, floors,

01000 - 7 of 12 Revised 05-08-20 Kansas City, Missouri Water Services Department Standard Specification roofs, piping, conduit, cable trays, HVAC equipment, architecture features, drains, gravel, coating systems, fences, furniture, tiling, fixtures, masonry, structural supports, doors, windows, skylights 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.

#### 1.29 WATER

- A. The City will furnish, without charge, all water necessary for the Work (i.e., filling, flushing, testing and disinfecting completed water lines). The Contractor or Design-Builder shall make arrangements with the City for all water used.
- B. Use of the City's water facilities shall be at the direction of the Water Services Department so that water is not wasted and service to customers is not impaired.
- C. Any water furnished by the City must be obtained from an existing City main.
- D. The Contractor or Design-Builder shall use a Reduced Pressure Zone (R.P.Z.) Backflow Preventer and meter when connected to the City's water system.
- E. When utilizing public hydrants, The Contractor or Design-Builder shall contact the Kansas City Fire Department (KCFD) at (816) 513-4645 to purchase a hydrant meter permit. After securing a hydrant meter permit from KCFD, the Contractor or Design-Builder shall present the permit to the Consumer Services desk located at Water Services Department headquarters, 4800 E. 63rd Street, KCMO. The Contractor or Design-Builder shall apply for and pay Consumer Services the refundable security deposit. If approved, the Contractor or Design-Builder shall contact the Water Services Backflow Department at (816) 513-4797 to schedule the installation of the R.P.Z./Meter (hydrant meter). The Contractor or Design-Builder shall provide the location of the hydrant where the R.P.Z./Meter is to be installed. The Contractor or Design-Builder shall contact the Backflow Department to have the R.P.Z./Meter moved or returned to Water Services. Jetting and Vacuum trucks with approved backflow prevention devices or air gap separation are not required to utilize a R.P.Z. backflow preventer; however, a meter to track water usage shall be used at all times. The Jetter/Vac Contractor or Design-Builder shall contact the Water Services Backflow Department for issuance of the meter and pay the associated refundable security deposit. In all cases, the Contractor or Design-Builder is solely responsible for any and all damage to the equipment issued by the Water Services Backflow Department. The cost to repair the damage or the cost of complete replacement of the unit shall be deducted from the security deposit.
- F. When utilizing hydrants on City projects after the facility's water meter, Contractor or Design-Builder shall utilize an RPZ/Meter that is pre-approved by the City. The location and duration for the connection must be submitted 15 days prior to the proposed connection. Any unapproved connections will be grounds for removal from the Site(s) by the connecting Contractor or Subcontractor.

# 1.30 ALL COSTS FOR LABOR, MATERIAL, EQUIPMENT AND SERVICES NEEDED TO OBTAIN WATER FOR CONSTRUCTION PURPOSES SHALL BE INCLUDED IN THE BID. NO SEPARATE MEASUREMENT OR PAYMENT WILL BE MADE TO MAKE CONNECTIONS.OPERATION OF EXISTING VALVES

- A. The Contractor or Design-Builder shall not operate any valves on the City's system outside the fence line without direct supervision from a Water Services Department representative.
- B. OCCP may allow for the contractor to operate valves and equipment.
- C. If the Contractor or Design-Builder needs valves operated, the request shall be made at least five (5) days in advance to Water Services for such operation, also giving notice to any affected customers/properties in accordance with the notification requirements outlined in Section 01581 Public Communications.
- D. All fire hydrants and water valves shall be kept free from obstruction and available for use at all times.

## 1.31 BARRICADES AND LIGHTS

- A. All streets, roads, highways, facility roads, and other public thoroughfares which are closed to traffic shall be protected by effective barricades and acceptable warning signs. Barricades shall be located per the approved traffic control plan and associated permit. RPR will approve the barricades for facility roads.
- B. All trenches and other excavations shall be covered and shall have suitable barricades, signs and lights to provide adequate protection to the public and City Staff. Obstructions such as material piles and equipment shall be provided with similar warning signs and lights in roads.
- C. All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise in the public right of way. Material storage and execution of the Work on or alongside public streets and highways shall cause the minimum obstruction and inconvenience to the traveling public.
- D. All barricades, signs, lights and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and as required by the authority having jurisdiction; such as, Work within railroad right-of-way, highway right-of-way, etc.

## 1.32 EXISTING FENCING

- A. All existing fences affected by the Work shall be maintained by the Contractor or Design-Builder until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence including the City and the period the fence may be left relocated or dismantled has been agreed upon.
- B. Where fences must be maintained across the construction easement or plant site, adequate gates or City approved access shall be installed. Facility Gates and Gates outside facilities shall be kept closed and locked at all times when not in use. Within Facilities, operations staff will determine what gates will need to be close and locked.

## 1.33 SAFETY FENCING

- A. Provide fencing along the construction site at all open excavations and tunnels to control access if the excavation or tunnel can otherwise be accessed by the public.
- B. Temporary safety fencing must be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 48 inches high and maximum

01000 - 9 of 12 Revised 05-08-20 Kansas City, Missouri Water Services Department Standard Specification mesh size of 2 inches, supported and tightly secured to steel posts located on maximum 10-foot centers, constructed at the approved location.

C. Remove the fence from the work site upon completion of the Work.

#### 1.34 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

- A. The Contractor or Design-Builder shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains and other underground construction uncovered or otherwise affected by the construction operations.
- B. All pavement, surfacing, driveways, curbs, gutters, sidewalks, buildings, utility poles, guy wires, fences, and all other features and structures affected by construction operations, together with all sod and shrubs in yards, parkways, medians and green spaces, shall be restored to their original condition, whether within or outside the right-of-way or easement. All replacements shall be made with new materials.

#### 1.35 DAMAGE TO EXISTING PROPERTY

- A. The Contractor or Design-Builder is solely responsible for any damage to existing features, structures, Work, materials, or equipment because of their operations and shall repair or replace any damaged features, structures, Work, materials, or equipment to the satisfaction of the City and at no additional cost to the City.
- B. The Contractor or Design-Builder shall protect all existing structures and property from damage and shall provide bracing, shoring, or other work necessary for such protection.
- C. The Contractor or Design-Builder is responsible for all damage to streets, roads, curbs, sidewalks, highways, shoulders, ditches, embankments, culverts, bridges, or other public or private property, which may be caused by transporting equipment, materials, or personnel to or from the Work. The Contractor or Design-Builder shall make satisfactory and acceptable arrangements with the agency having jurisdiction over the damaged property concerning its repair or replacement.

## 1.36 NOISE CONTROL

- A. The Contractor or Design-Builder shall conduct construction operations as described herein and in compliance with the City of Kansas City, Missouri Code of Ordinances, Chapter 46 NOISE CONTROL.
- B. The Contractor or Design-Builder shall take all reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices and operated in a manner to cause the least noise, consistent with the efficient performance of the Work.
- C. During construction activities on or adjacent to occupied buildings and when appropriate, the Contractor or Design-Builder shall erect screens or barriers effective in reducing noise in the building and shall conduct their operations to avoid unnecessary noise which might interfere with the activities of the building occupants.
- D. Contractor or Design-Builder shall insure no facilities will have noise levels that prevent a full shift at the facility per OSHA safety standards.
- E. All work including, but not limited to, excavation, demolition, alteration, or repair being performed in or adjacent to a residential area other than between the hours of 7:00 a.m. and 6:00 p.m. on weekdays, except in the case of urgent necessity in the interest of public safety, shall require a letter of permission from the Water Services Department of the City of Kansas City, Missouri.

01000 - 10 of 12 Revised 05-08-20 Kansas City, Missouri Water Services Department Standard Specification

#### 1.37 DUST CONTROL

- A. The Contractor or Design-Builder shall control dust in accordance with Section 01566 – Cleanup Operations, paragraph DUST CONTROL. The Contractor or Design-Builder 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 practicable, dusty materials in piles or in transit shall be covered to prevent blowing.
- B. Buildings or operating facilities which may be affected adversely 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.

#### 1.38 POLLUTION CONTROL

A. The Contractor or Design-Builder shall prevent the pollution of drains (Combined Sewer, plant piping, Storm Sewer), 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.

#### 1.39 SECURITY

- A. The Contractor or Design-Builder is solely responsible for security and protection of the site. This includes protecting all Work, materials, equipment, existing facilities and all temporary facilities against theft, vandals and access by unauthorized persons.
- B. No claim shall be made against the City by reason of an act of an employee or trespasser. The Contractor or Design-Builder shall make good on all damage and theft of property resulting from the Contractor or Design-Builder's failure to provide adequate security measures including City Property. After trespass or theft, the City may direct the Contractor or Design-Builder to provide additional site security at no cost including but not limited to security cameras, on site security, and night security.

#### 1.40 PARKING

A. The Contractor or Design-Builder shall provide and maintain suitable parking areas for the use of all City personnel, construction workers and others performing work or furnishing services in connection with the Project. Suitable parking is required to avoid the need for parking personal vehicles where they may interfere with traffic, City's operations, or construction activities. Location of the parking within Facilities should be mutually agreed up by the operating division manager and the Contactor or Design-Builder. Operating Division Manager may change parking areas as need to maintain operations PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION Not used.

# 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)
  - 12. Section 01433 Manufacturers' Field Services
  - 13. Section 01664 Training
  - 14. Section 01757 Commissioning

#### 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.
  - 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.
- 9. Submit training materials and recordings of training sessions as described in Section 01757 Commissioning.
- 10. Submit approved Acceptance Test Plan developed in accordance with Section 01757 Commissioning and with this Section.
- 11. Deliver tools, spare parts, extra material, and maintenance products in accordance with Section 01600 Product Delivery Storage and Handling.
- 12. Submit changeover information related to Owner's use, operation, and maintenance.
- Prepare and submit draft Project Record Documents prepared in accordance with Section 01700 Execution Requirements and submitted in accordance with the requirements of this Section.
- 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 Division1 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.

01019 – 2 of 5 Revised 06/03/21 Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

- 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. Complete Installation and Functional Testing of all equipment, systems and subsystems in accordance with Section 01757 Commissioning.
  - 4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems in accordance with Section 01757 Commissioning.
  - 5. Clean the project area of construction debris and other construction effects.
  - 6. Terminate and remove temporary facilities from the Project site, along with mockups, construction tools, and similar elements.
  - 7. Complete final cleaning requirements, including touchup painting.
  - 8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
  - 9. 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.

01019 – 3 of 5 Revised 06/03/21

- The Contractor or Design-Builder shall pay for any re-inspection other than the first reinspection. 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.

01019 – 4 of 5 Revised 06/03/21 Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

- 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 01322 Photogram Documentation.
- K. Section 01335 Document Management.
- L. Section 01340 Project BIM Coordination
- M. Section 01664 Training.
- N. Section 01757 Commissioning.

#### 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.

01020 - 1 of 9 Revised 08/27/20 Kansas City, Missouri Water Services Department Standard Specification

- 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.
- 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<sup>®</sup> .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.

01020 – 2 of 9 Revised 08/27/20 Kansas City, Missouri Water Services Department Standard Specification 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

01020 - 3 of 9 Revised 08/27/20

#### 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.
  - 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:

- 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.

01020 - 5 of 9 Revised 08/27/20 Kansas City, Missouri Water Services Department Standard Specification

- 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:	<i>Date:</i>
Name (print):	<i>Title:</i>
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 (print):	Title:
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<sup>®</sup> .dwg format or AutoCAD<sup>®</sup> 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.

01020 - 8 of 9 Revised 08/27/20 Kansas City, Missouri Water Services Department Standard Specification

- 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 01322 – Photographic Documentation, Section 01664 – Training, Section 01757 – Commissioning, 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.
- E. Television Inspection data files as specified in Section 02686 CCTV Inspection.

## END OF SECTION

## SECTION 01021 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

#### 1.01 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.

#### 1.02 RELATED DOCUMENTS

- A. 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.
- B. 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 01322 Photogram Documentation
  - 10. Section 01335 Document Management
  - 11. Section 01664 Training
  - 12. Section 01757 Commissioning

#### 1.03 REQUIRMENTS

- A. Contractor shall prepare and provide data and materials, and provide instruction and services, as specified in this Section.
- B. 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.
- C. Prepare O&M Data as specified in this Section and as referenced in other pertinent sections of the Specifications.
- D. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems, including electrical and instrumentation.

#### 1.04 DEFINITIONS

- A. 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.

01021 – 1 of 14 Revised 06/03/21

Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

- B. Preliminary Data: Initial and subsequent submissions for the City's Representative's review.
- C. Final Data: City's Representative accepted data, submitted as specified herein.
- D. 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.

## 1.05 SUBMITTALS

- A. 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:
      - (1) All copies will be returned to Contractor or Design-Builder with City's Representative's comments (on separate document) for revision.
      - (2) City's Representatives comments will be retained in City's Representative's file.
      - (3) Resubmit two copies revised in accordance with City's Representative's comments.

## 1.06 SEQUENCING AND SCHEDULING

- A. 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.
- B. 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

- 2.01 DATA FORMAT (for Original Equipment Manufacture Operations and Maintenance Manuals OEM O&Ms)
  - A. Prepare preliminary and final data in the form of an instructional manual. Prepare final data on electronic media and printed.
  - B. Instructional Manual Format:
    - 1. Binder: Commercial quality, permanent, three ring or three post binder with durable plastic cover.
    - 2. Size: 8 <sup>1</sup>/<sub>2</sub> 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.

- C. 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:
      - (1) Project Title
      - (2) Contractor's name, address, and telephone number.
      - (3) 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:
      - (1) Include list of each product, indexed to content of each volume.
      - (2) Designate system or equipment for which it is intended.
      - (3) Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
    - e. Section Dividers:
      - (1) Heavy, 80 pound cover weight, tabbed with numbered plastic index tabs.
      - (2) 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:
          - (i) Name, address, and telephone number of Sub-contractor, Supplier, Installer, and Maintenance Contractor or Design-Builder, as appropriate.
          - (ii) Identify area of responsibility of each.
          - (iii) 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.
- D. 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.

01021 - 4 of 14 Revised 06/03/21

- E. 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:
      - (1) Identify specific product or part installed.
      - (2) Identify data applicable to installation.
      - (3) 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:
    - (1) Provide reinforced, punched, binder tab; bind in with text.
    - (2) Reduced to 8 <sup>1</sup>/<sub>2</sub> inches by 11 inches, or 11 inches by 17 inches folded to 8 <sup>1</sup>/<sub>2</sub> inches by 11 inches.
    - (3) Where reduction is impractical, fold and place in 8 <sup>1</sup>/<sub>2</sub> inch by 11 inch envelopes bound in text.
    - (4) 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:
      - (1) Organize in consistent format under separate heading for each different procedure.
      - (2) Provide logical sequence of instructions for each procedure.
      - (3) 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:
      - (1) Startup, break-in, routine, and normal operating instructions.

01021 - 5 of 14 Revised 06/03/21 Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

- (2) Test procedures and results of factory tests where required.
- (3) Regulation, control, stopping, and emergency instructions.
- (4) Description of operation sequence by control manufacturer.
- (5) Shutdown instructions for both short and extended duration.
- (6) Summer and winter operating instructions, as applicable.
- (7) Safety precautions.
- (8) Special operating instructions.
- d. Maintenance and Overhaul Procedure:
  - (1) Routine maintenance.
  - (2) Guide to troubleshooting.
  - (3) Disassembly, removal, repair, reinstallation, and re-assembly.
  - (4) 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.
- F. 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.

01021 - 6 of 14 Revised 06/03/21

- 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.
- G. 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  $\frac{1}{2}$  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.
- H. 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.

## 2.02 DATA FOR MATERIALS AND FINISHES

- A. 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.

01021 - 7 of 14 Revised 06/03/21

- 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.
- B. 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.

#### 2.03 ELECTRONIC O&M MANUAL (E-O&M)

- A. 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.
- B. All files submitted as part of the E-O&M shall be tagged per the Record File Standard.

01021 - 8 of 14 Revised 06/03/21 Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

- C. PDF shall be bookmarked and hyperlinked.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. 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.
- I. Complete a short-circuit device coordination and arc flash study computer model developed in SKM.
- J. Update SKM load study provided by the Owner.
- K. 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.

#### 2.04 PROGRAMS

- A. 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.

#### 2.05 SUPPLEMENTS

- A. The supplements listed below, following "End of Section", are part of this Specification.
  - 1. Forms: Asset Maintenance Summary Form.

## PART 3 - EXECUTION (NOT USED)

01021 - 9 of 14 Revised 06/03/21

# END OF SECTION

Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

## ASSET MAINTENANCE SUMMARY FORM

PROJECT		CONTRACT NO	
KCMO CMMS TAG			
EQUIPMENT ITEM			
MANUFACTURER			
PID/TAG NUMBERS			
WEIGHT OF INDIVIDU	JAL COMPONENTS (OVE)	R 100 POUNDS)	
NAMEPLATE DATA (	hp, voltage, speed, etc.)		
MANUFACTURER'S LO	CAL 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 t	his contract with two asterisks			
#### SECTION 01110 SUMMARY OF WORK

#### PART 1 GENERAL

#### 1.01 LOCATION OF WORK

A. The work of this Contract is located at Birmingham Pump Station at 11011 Birmingham Road in Kansas City, Missouri 64161.

#### 1.02 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and construct the Birmingham Pump Station Screen Replacement project in its entirety as shown on the Drawings and as specified herein for a fully functioning system.
- B. The Work includes, but is not necessarily limited to, the following:
  - 1. Demolition and removal of existing facilities as indicated and necessary for the construction of the project, including slide gates and screens. Demolition of one make up air unit as shown on the drawings.
  - 2. Installation of new equipment including gates, screens, conveyor, and odor control system.
  - 3. Construction of concrete walls, grating and hatches, and equipment pads.
  - 4. Providing two 20-yard dumpsters.
  - 5. New air handling equipment as indicated.
  - 6. Electrical modifications, and installation of new equipment as shown on the Drawings.

#### 1.03 WORK SEQUENCE

- A. Perform Work in sequence as indicated in the contract documents to ensure completion of the Work in the Contract Time. Completion dates of the various stages shall be in accordance with the approved construction schedule submitted by the Contractor.
- 1.04 CONTRACTOR'S USE OF PREMISES
  - A. Contractor shall limit the use of the premises for his/her Work and for storage to allow for:
    - 1. Owner occupancy.
  - B. Coordinate use of premises with Owner.
  - C. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors materials and equipment stored on the site.
  - D. If directed by the Owner, move any stored items which interfere with operations of Owner or other contractors.

E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

#### 1.05 OWNER OCCUPANCY

A. Owner will occupy premises during performance of the work for the conduct of his/her normal operations. Coordinate all construction operations with Owner to minimize conflict and to facilitate Owner usage.

#### 1.06 CONSTRUCTION COORDINATION

A. Contractor shall coordinate with the Owner regarding scheduling and sequence of work.

#### END OF SECTION

#### SECTION 01140 - WORK RESTRICTIONS

#### PART 1 – GENERAL

#### 1.01 SUMMARY

A. Section includes: Requirements for sequencing and scheduling the Work affected by existing site and facility; work restrictions; and coordination between construction operations and facility operations.

#### 1.02 SUBMITTALS

- A. Baseline Schedule with OCCP tasks.
- B. Operational Change Control Plan (OCCP) Form.
- C. Progress Schedule with OCCP tasks.

#### 1.03 GENERAL CONSTRAINTS ON SEQUENCE AND SCHEDULING OF WORK

- A. Wastewater projects:
  - 1. The Birmingham Pump Station is the City's only means of conveying sewage for the designated service area prior to the Birmingham Wastewater Treatment Plant. Impairing the operational capabilities of this pump station will result in serious environmental damage and monetary fines.
  - 2. Conduct Work in a manner that will not impair the operational capabilities of essential elements of the pump station or reduce the capacity of the entire system below levels sufficient to transmit raw wastewater to the treatment facility.
  - 3. Conduct commissioning and process start-up activities as specified in Section 01757 -Commissioning in a manner that will not impair the operational capabilities of essential elements of the pump station or reduce the capacity of the entire system below levels sufficient to transmit raw wastewater to the treatment plant.
  - 4. The status of the pump station shall be defined as "operational" when it is capable of transmitting the entire quantity of wastewater received at the Birmingham Pump Station to the wastewater treatment plant.
- B. Work sequence and constraints:
  - 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.
- C. Instrumentation and controls process performance testing:
  - 1. After the Process Operational Period, test PCIS system as specified in Section 01757 Commissioning.

#### 1.04 SHUTDOWN AND CONSTRUCTION CONSTRAINTS

- A. Normal working hours:
  - 1. Construction will take place during normal working hours as defined:
    - a. 7AM to 3PM Monday through Friday.
    - b. Refer to 00700 General Conditions Section 6.03 for further restrictions.

01140 – 1 of 5 Revised 07/02/21 Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

- B. General shutdown constraints:
  - 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 facility 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. Notify the City at least 2 weeks in advance of any tasks that will require dewatering and cleaning to allow the City the appropriate amount of time to conduct the work.
  - 8. Where required to minimize treatment process interruptions while complying with specified sequencing constraints, provide temporary pumping, power, lighting, controls, instrumentation, and safety devices.
  - 9. Final determination of the permitting of shutdowns will be the sole judgment of the Owner.
  - 10. Owner maintains the ability to abort on the day of the scheduled shutdown or to hold at any hold point.
- C. General maximum facility flow work limitations:
  - 1. Activities that disrupt pump station operations are prohibited during the following influent flow conditions, unless otherwise approved in writing by the Engineer, or specified in 01140.01 Process and System Shutdown Constraints Schedule:
    - a. 16 MGD
- D. Unit process availability work limitations:
  - 1. Shutdowns and tie-ins or other activities that disrupt pump station operations shall not occur if the following conditions exist unless approved by the OWNER in writing, or specified in 01140.01 Process and System Shutdown Constraints Schedule:
    - a. Rainfall has occurred in the 2 days preceding the shutdown.
    - b. Rainfall is forecast for more than 3 of the first 14 days of the shutdown period.
- E. Shutdown activities:
  - 1. Scheduling:
    - a. Perform between the hours of 10 p.m and 4 a.m. unless otherwise specified herein or as approved by Owner.
  - 2. Unplanned shutdowns due to emergencies are not defined in this Section.
- F. Dewatering of existing process and disposal of residue:
  - 1. When the Owner has turned the process unit over to the Contractor for modification or temporary use, the Contractor is responsible for costs and procedures required to dewater and dispose of liquid, solids, etc. in the process unit unless the Owner has made prior arrangements.
    - a. Drainage and disposal of process unit liquids, solids, etc. into another treatment process unit on the site may be allowed if approved in advance by the Engineer and Owner and is conducted in accordance with the Project requirements.
    - b. Costs for dewatering, disposal of solids and residuals, and preparation of surfaces for the Work are Contractor's responsibility.
      - (1) Includes tipping fees for the removal and disposal of the grit/debris.
    - c. Dewatering of grit/debris to meet landfill requirements is the responsibility of the Contractor.

01140 – 2 of 5 Revised 07/02/21 Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

- d. Contractor shall provide adequate time in schedules for draining and cleanup of basins and channels.
- G. Refer to the Process and System Shutdown Constraints Schedule in Section 01140.01 for additional requirements.
- 1.05 OPERATIONAL CHANGE CONTROL PLAN (OCCP)
- A. Refer to Section 01140.02 Operational Change Control Plan (OCCP) Documents for additional requirements.
- B. Submit Baseline Schedule, as specified in Section 01320 Construction Progress Documentation.
- 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 facility and compliance with effluent discharge criteria.
- D. Where required to minimize treatment process interruptions while complying with specified sequencing constraints, provide temporary pumping, power, lighting, controls, instrumentation, and safety devices.
- E. OCCPs are required whenever an existing asset or a new asset that could affect treatment or conveyance are modified including but not limited to set points and operational modes.

# 1.06 REQUIREMENTS FOR OPERATION OF PUMP STATION AND MAINTAINING CONTINIOUS OPERATION OF EXISTING FACILITIES

- A. Facilities or conditions required to keep the existing pump station operational include, but are not limited to, the following:
  - 1. Electrical power including transformers, distribution wiring, and motor control centers.
  - 2. Pumping and piping for conveyance of wastewater.
  - 3. Fencing and gates.
  - 4. Lighting.
  - 5. Ventilation.
  - 6. Instrumentation, meters, controls, and telemetry equipment.
  - 7. Safety equipment and features.
  - 8. Parking for City employees and vehicles required for operation and maintenance of the facilities.
  - 9. Utilities.
- B. Contractor shall protect existing grating with steel traffic plate or other Engineer approved means when moving equipment or supplies over grating.
- C. Maximum allowable superimposed live load on any existing grating or walkway shall be 50 psf. If higher loads are proposed, provide detailed calculations demonstrating adequacy of grating or walkway system for higher loads. The calculations shall be sealed and signed by a registered professional engineer and submitted to the Engineer for review and acceptance.

#### 1.07 OPERATION AND MAINTENANCE ACCESS

A. Provide safe, continuous access to process control equipment for operations personnel.

#### 1.08 COORDINATION OF THE WORK

- A. Maintain overall coordination of the Work.
- B. Obtain construction schedules from subcontractors and suppliers and assume responsibility for correctness.
- C. Incorporate schedules from subcontractors and suppliers into Progress Schedule to plan for and comply with sequencing constraints.

#### 1.9 WORK BY OTHERS

A. Where proper execution of the Work depends upon work by others, inspect and promptly report discrepancies and defects.

#### 1.10 UTILITIES

- A. Provide advance notice to request and utilize services of the Missouri One Call System (www.molcall.com or 1-800-344-7483 (DIG-RITE)) for location and marking of underground utilities operated by utility agencies other than the Owner.
- B. Maintain electrical, telephone, water, gas, sanitary facilities, and other utilities within existing facilities in service. Provide temporary utilities when necessary.
- C. New yard utilities were designed using existing facility drawings.
  - 1. Field verification of utilities locations was not performed during design.
  - 2. Services crossed or located nearby new yard utilities may require relocation and possible shutdowns.

#### 1.11 WORK CONSTRAINTS

A. Work constraints are included in Section 01140.01 Process and System Shutdown Constraints Schedule.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 – EXECUTION

#### 3.01 PROCESS AND SYSTEM SHUTDOWN CONSTRAINTS SCHEDULE

- B. Refer to the Process and System Shutdown Constraints Schedule in Section 01140.01 for constraints on process and system shutdowns.
- C. Requests for variance from any part of this schedule must be approved in writing by the OWNER.
- D. 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.
- E. These constraints are intended to supplement the demolition, modification, tie-in, and construction activities and constraints described in Article 1.12 of this Section.

01140 – 4 of 5 Revised 07/02/21 Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

#### END OF SECTION

Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

#### 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 7300 Hawthorne Road • Kansas City, MO 64120 P: 816-513-7200 • F: 816-513-7271 • www.kcwater.us

## **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.

<u>Do not delete any sections</u>. 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.

**Table of Contents** 

1. Date	Page 1
2. Version	Page 1
3. OCCP Number	Page 1
4. Facility Name/ Facility ID	Page 1
5. Project Execution Start Date	Page 1
6. Description of Works	Page 1
7. Key Plan Information	Page 1
8. Significant Project and Meeting Dates	Page 2
9. Project Milestones/ Execution Steps	Page 2
10. Works to be completed prior start of OCCP	Page 5
11. Contingency Actions	Page 5
12. Job Hazard Analyses	Page 5
13. Affected Monitoring Points and Impact	Page 6
14. Water Quality Impacts	Page 7
15. Notifications	Page 7
16. Contractor OCCP Development and Sign Off	Page 8
17. Notification to Stakeholders	Page 9
18. Final Authorization/Approval Date	Page 10

1. Date	
2. Version (use modifier starting with A at end of OCCP number when document changes substantially)	
3. OCCP Number	
4. Facility Name/ Facility ID	
5. Project Execution Start Date	

6. Description of Works (provide a brief summary of the work to be performed)

7. KeyPlan 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/ExecutionSteps (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

Operational Condition	Contingency Action

#### 10. Works to be completed prior start of OCCP (this will result from the initial OCCP meeting)

#### **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

Process Description	Describe Alternate or Interim Operation

# c. Treatment Process Affected (define which process will be impacted and how any alternate or interim operation will be implemented)

#### 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

Individual or Entity	Name and Phone Number

#### 15. External Stakeholders To Be Notified (these include neighboring residential and businesses)

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**

PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Listing of allowance items:
    - a. Related responsibilities of Contractor and procedures.

#### 1.02 ALLOWANCE AMOUNTS

- A. Include following amounts in Contract Price:
  - 1. Unforeseen Site Conditions: \$100,000.

#### 1.03 COSTS INCLUDED AND EXCLUDED IN ALLOWANCES

A. Costs included in allowances for furnishing products only:

- 1. Net cost of product.
- 2. Delivery and unloading at site.
- **3**. Applicable taxes and fees.

B. Costs included in Contract Price, but not included in allowances for furnishing products only:

- 1. Handling at site, including uncrating and storage.
- 2. Protection from elements, theft, and damage.
- **3**. Labor, installation, testing, and finishing.
- 4. Other expenses required to complete installation.
- 5. Overhead and profit.

#### C. Costs included in allowances for furnishing and installing products:

- 1. Net cost of product.
- 2. Delivery and unloading at site.
- 3. Applicable taxes.
- 4. Handling at site, including uncrating and storage.
- 5. Protection from elements and from damage.
- 6. Labor, installation, testing, and finishing.
- 7. Other expenses required to complete installation.

#### 1.04 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:
  - 1. Quantity.
  - 2. Complete description of product and services provided under allowance.
  - 3. Unit cost.
  - 4. Total amount of purchase.
  - 5. Taxes and delivery charges.
- C. On notification of selection, enter into purchase agreement with designated supplier.
- D. Arrange for delivery and unloading.
- E. Install products in accordance with Contract Documents.

#### 1.05 ADJUSTMENT OF COSTS

- A. When actual cost is more or less than amount of allowance, Contract Price will be adjusted by Change Order.
- PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

#### END OF SECTION



MISSOURI

## **ALLOWANCE AUTHORIZATION**

Project/Contract Numbers: 81000928/1662

Project Title: Birmingham Pump Station Screen Replacement

То:	Authorization Number:
	From:
Re:	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 Allowa Allowance Exp Allowance Bala Allowance will New Allowance	nce enditures prior to this Au ance prior to this Authori be [❑ increased] [❑ deo e Balance	uthorization zation creased] by this Author	ization	\$ \$ \$ \$				
APPROVAL R	ECOMMENDED	CITY	CITY APPROVAL					
Design Profession	al Date	City's R	epresentative	Date				
		CONT	CONTRACTOR ACCEPTANCE					
Construction Mana	iger Date	Contrac	Contractor Date					
Attachments	:							
Distribution:	<ul> <li>City</li> <li>Contractor</li> <li>Construction Manage</li> </ul>	ger						

- Design Professional
- Consultant
- Other

#### **SECTION 01230 - ALTERNATES**

#### PART 1 GENERAL

#### 1.01 SUMMARY

A. Section includes: Identification and description of Alternates.

#### 1.02 PROCEDURES

- A. Alternates will be exercised at Owner's option.
- B. Coordinate related work and modify surrounding work as required to complete the Work, including changes under Alternates accepted by Owner in Notice of Award.

#### 1.03 ALTERNATES

- A. Bid Required Alternate No. 1
  - 1. Base Bid: Section 11330 Paragraph 2.01.A Duperon FlexRake® as indicated and specified.
  - 2. Bid Alternate: Parkson Aqua Caiman®
    - a Any alternate system must meet all requirements of specified system.
    - b All redesign costs must be included in the alternate bid price.
    - c Any construction modifications must be included in the alternate bid price.
- B. Required Alternate No. 2:
  - a. Per Sheet SD100, Note 8, Removal of existing concrete blocks in channels and patch as necessary.
- C. Additional Alternatives
  - a. Any proposed equal as an alternate system must be approved by engineer to meet all requirements of the specified system. Proposed equals for equipment items must demonstrate a minimum of five (5) equivalent installations in the United States that have operated for more than five (5) years.
  - b. All redesign costs must be included in the alternate bid price.
  - c. Any construction modifications must be included in the alternate bid price.

#### PART 2 PRODUCTS

Not Used.

#### PART 3 EXECUTION

Not Used.

#### END OF SECTION

01230 – 1 of 1 Revised 06/14/21

APPLICATION Project Numbe Project Title	FOR er				
KANSAS CITY MISSOURI		2			Final Payment <sup>5</sup> □
CONTRACTOR		Application Number <sup>2</sup> :			
		Ordinance/Resolution Number:			
Address		Effective: PO Number Vendor Number			
Application for Work Accomplished from	I		to		
Original Contract Price	[1]			\$	-
Net by Change Ordersthrough			[2]	\$	-
Current Contract Price (1+2)			[3]	\$	-
Completed Work	[4]		_		
Disputed Amounts <sup>3</sup> [-]	[4a]	\$-	_		
Stored Material <sup>4</sup>	[5]	\$-	_		
Disputed Amounts <sup>3</sup> [-]	[5a]	\$-	_		
Total Completed and Stored to Date (4+	5)		[6]	\$	-
Previous Payments	[7]		-		
Previous Retainage	[8]		101	<b>^</b>	
Amount This Applications (7+8)			[9]	\$ ¢	-
Less Retainage This Application (5%)		[-]	[10]	φ \$	-
Release of Retainage		[]	[12]	\$	
Total Due This Application (10-11+12)			[13]	\$	-
Liquidated Damages					
Completion of Work	[14]	\$ -	[-]	\$	-
Prevailing Wage <sup>7</sup>	[15]	\$ -	[-]	\$	-
MBE/WBE Program <sup>7</sup>	[16]	\$ -	[-]	\$	-
Workforce Program <sup>7</sup>	[17]	\$ -	[-]	\$	-
Total Amount Due Contractor (13 - 14	throu	gh 17)	[18]	\$	-

#### Accompanying Documentation: <sup>1, 2, 3, 4, 5, & 6</sup> 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:**

CITY OF FOUNTAINS

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.

		Ву	
Contractor		Authorized Representative (Print)	Signature
Date			
State of	) )SS		
County of	)		
Subscribed and Sworr	n to before me this	day of	_,
My commission expire	es:		
	Notary Pu	blic:	

#### 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) <sup>1</sup>See General Conditions Article 14.02 A and B <sup>2</sup>Proof of tax compliance if 1st payment and if Contract amount exceeds \$150,000.00 <sup>3</sup>Schedule of Values–Denote any amounts currently disputed in this application. Attach additional dispute documentation if required. <sup>4</sup>If requesting payment for stored materials, see General Conditions Article 14.02 A.1 <sup>5</sup>If final payment, current proof of tax compliance if Contract is longer than 1 year and amount exceeds \$150,000.00. <sup>6</sup> 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** <sup>7</sup>Applicable 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 amendements 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	

Contract Central

	(MA)	9	SCHEDULE OF VALUES															
	ч ШП	ľ											HR	D APPROVED	CUP	]		
	գլթ			Project Number								_	MBE	WBE	DBE			
	Ψ	1.7.9											\$0.00	\$0.00	\$0.00			
	MISSOU	R I		Project Title									%	%	%			
				-								-						
A	В	C		E	F	G	н		J	ĸ	\$ TOTAL COMPLETE	ED AND	N	0	Р	Q	ĸ	s
SPEC	UNIT	PRICE CON	TRACTS	DESCRIPTION OF WORK		NO. OF	\$ TOTAL OR LUMP	UNITS	\$ COMPLETED	\$ STORED	STORED TO DA	TE		TOTALS TO DATE		% AT	\$ TOTAL PREVIOUS	\$ AMOUNT THIS
SECTION	UNIT ITEM	UNIT	ESTIMATED	UNIT ITEM DESCRIPTION	\$ UNIT PRICE	UNITS	SUM	ETE	WORK	MATERIAL	\$ J+K	% J/H	\$ MBE	\$ WBE	\$ DBE	M	APPLICATIONS	L-R
	140.		QUANTIT													D/I		
-																O/L		
																N/L		
																	'	
	1															l —		1
																	<sup> </sup>	i
																	l	
																	'	
-																		l
																		}
-																	l	
																		1
																	<sup> </sup>	i
																		l
	-			1	-													1
																	l	
				1	1											l		1
	1																	1
			-															1
																		ĺ
																	L	I
	-			1	-													1
	1			1	1													1
																	1	

CITY OF FOUNTAINS



## 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.
- 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 semiskilled, 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.

CITY OF HEART O	FOUNTAINS F THE NATION			·	C	ERTIFI	ED PA	YROL	L RE	PORT		-			
a	in the second		Proje	ect Nu	mber:										
ן י י	)' ——		Р	roject	: Title:										
(	Ψ'		Payr	oll Nu	mber:							□ Final			
KANS MIS	AS CITY SOURI		WEE	K ENDING:	(2)			SHEET	T(3)	of		GRANT AGENCY P	ROJECT NO.:	$\overline{(4)}$	
CONTRACTOR:	(5)				SUBCONT	RACTOR:	(6)					DEPT PROJECT O	R COMTRACT NO .:	(7)	
ADDRESS:					ADDRESS:		$\sim$					LOCATION:			
CITY, STATEZIP:	(10a)				CITY, STAI		(10b)					DESCRIPTION:	( 9	)	
TEDERALI.D. NOWDER	First Name	LastName	DATE	(13)			100								
EMPLOYEE NAME		Lastrianc	DATE.	MON	TUES	WED	THUR	FRI	SAT	SUN	TATAL HRS	BASE RATE	OT RATE	FRINGE RATE	τοται
ADDRESS:			REG HRS	14)	TOLO	WED	THOR	110	0/11	0011	$(17)_{0.00}$	\$ (21) -	OTTIVIL	TRINGETORIE	\$ (25) -
CITY, STATE ZIP:			O.T. HRS.	(15	<u>ب</u>					(	18 0.00	• 21	<u></u> \$ (22) _	٦	\$ (26)
SOCIAL SECURITY NO	. (12)		D.O.T. HRS.	16	1						19 0.00		\$ (23)-		\$ (27) = -
OCCUPAT	FIONAL TITLE / CLAS	SSIFICATION:			1	1	1	τοτα	L FRINGE	HOURS( 2	20 0.00			\$ (24) -	\$ (28)
	(30)			$\sim$			$\sim$					1	FRINGE PAID TO-	APPROVED PLAN	29a
			GROUP:	(31)	SKILL	GROUP:	(32)						(29		\$ (29b)
WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:		FICA:		STATE:	_	LOCAL E-	TAX:	MISC:	NET PAY:	EARNINGS FOR TH	IS JOB:	\$(41)
	(33)	\$ (34) -	\$ (3	5) -	\$ ( )	36) -	\$ (3	7) -	\$ (3	38) -	\$(39)	\$ (40) -	KANSAS CITY EARN	INGS TAX THIS JOB	\$ (42)-
	First Name	LastName	DATE	Ī			Ì		Ì		Ť				
EMPLOYEE NAME		Luotinumo	Drift E.	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS	BASE RATE	O T RATE	FRINGE RATE	τοται
ADDRESS'			REG HRS	mon	1020	TTED	mon		0, (1	0011	0.00	\$ -	0.1.10112	THINGETURE	\$ -
CITY, STATE ZIP:			O.T. HRS.								0.00	Ŷ	\$-	٦	\$ -
SOCIAL SECURITY NO			D.O.T. HRS.								0.00		\$-	-	\$ -
OCCUPAT	FIONAL TITLE / CLAS	SSIFICATION:		1	1	1	1	τοτα	L FRINGE	HOURS	0.00		<b>.</b> .	\$-	\$ -
											I	,	FRINGE PAID TO:	APPROVED PLAN	\$-
			GROUP:		SKILL	GROUP:					1			EMPLOYEE	\$ -
	HOURS	GROSS FARMINGS			EICA:		STATE			τΔχ·	MISC	NET PAY	EARNINGS FOR TH	IS IOB:	\$
	110 0110.	\$ -	\$	-	\$	-	\$	-	\$	-	\$ -	\$ -	KANSAS CITY FARN	INGS TAX THIS JOB	\$ -
	Einst Nie er e	Lesthless -	DATE							Ι			1		
	First Name	Last Name	DALE:	MON	THEO		TUUD	EDI.	CAT	CLINI					TOTAL
				MON	TUES	VVED	THUR	FRI	SAI	SUN		BASE RAIE	U.I.RAIE	FRINGERALE	TOTAL
ADDRESS:			REG. HRS.								0.00	ъ -	¢	7	ۍ -
SOCIAL SECURITYNO		Í									0.00		р – С		ə -
		SSIFICATION	D.0.1.111(0.					τοτα		HOURS	0.00		Ψ -	\$ -	φ - \$ -
0000174								1017	ETTUTOE		0.00	1	FRINGE PAID TO		\$ -
			CROUD:	1	SKILL		1				٦		THURSELFIE FO.		¢
WEEK ALL LORG	HOURS	GROSS FARMINGS	EEDERAL		FICA	GROUF.	STATE			ΓΔΥ·	MISC	NET PAY			s -
WEEKAEL JOBS.	100100.	\$ -	\$	-	\$		STATE.		S	-	\$ -	S -	KANSAS CITY FARM	INGS TAX THIS JOB	\$ -
	Elect NL	L ant New		I	I ~	l	⊥* 		1 *	I	· · ·	Ŧ		1	•
	First Name	Last Name	DALE:						o 17	<b>0</b> 1111					
EMPLOYEE NAME:	-			MON	TUES	WED	THUR	FRI	SAT	SUN	IUIALHRS	BASERATE	0.1.RATE	FRINGERATE	TOTAL
ADDRESS:	-		REG. HRS.								0.00	۶ -	¢.	٦	<u>ه</u> -
UT Y, STALEZIP:		1	U.T. HRS.	<u> </u>							0.00	-		_	<u>۶</u> -
SUCIAL SECURITYNO			U.U.T.HRS.		L		1	TOTA			0.00	-	<b>\$</b> -	¢	ъ -
UCCUPA	HONAL TILE/CLAS							TOTA	FRINGE	100K5	0.00	J			ф -
			ODOUD	I	0.00		1				7		FRINGE PAID TO:		¢ -
	HOURC		GROUP:	1	SKILL	GROUP:	CT AT C.				MICC	NET DAV			¢ -
WEEN ALL JUBS:	nuuka:	¢	¢		¢		¢		¢	1 <i>H</i> A.	¢	¢	KANISAS CITVEADA		φ -
		Ψ -	Ψ	-	Ψ	-	Ψ	-	Ψ	-	ψ -	Ψ -	INNORO CITI LARIN		Ψ

CITY OF FOUNTAINS HEART OF THE NATION					C	ERTIF	ED PA	YROL	L REP	ORT					
			I	Project	Number:							-			
				Proj	ect Title:										
Ψ'			ļ	Payroll	Number:						_	Final			
KANSAS CITY MISSOURI			WE	EK ENDING				SHEET	-	of		GRANT AGENCY PR	ROJECT NO.:		
CONTRACTOR:					SUBCONTR	ACTOR:						DEPT PROJECT OR	CONTRACT NO .:		
ADDRESS:					ADDRESS:		_					LOCATION:			
CITY, STATE ZIP:					CITY, STATI	ZIP:						DESCRIPTION:			
FEDERAL I.D. NUMBER:	Elect Marco	Last Marson	DATE	T	FEDERAL I.	D. NUMBER:		1	1		Т			1 1	
ΕΜΡΙ ΟΥΕΕ ΝΔΜΕ΄	First Name	Last Name	DATE:	MON	THES	WED	THUR	FRI	SAT	SUN	TOTAL HRS	BASE RATE	OT RATE	FRINGE RATE	τοται
ADDRESS:			REG HRS	MON	TULS	WLD	mon	T INI	541	3014	0.00	\$ -	0.1. IAIL		\$ -
CITY STATE ZIP			OT HRS								0.00		\$ -	7	\$
SOCIAL SECURITY NO.:			D.O.T. HRS.								0.00		\$ -	-	\$ -
OCCUP	ATIONAL TITLE / CLA	SSIFICATION:		1				TOT	AL FRINGE H	IOURS	0.00			\$-	\$ -
								<b>.</b>				_	FRINGE PAID TO:	APPROVED PLAN	\$-
			GROUP:		SKILL	GROUP:					1			EMPLOYEE	\$-
WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:		FICA:		STATE:		LOCAL E-T	AX:	MISC:	NET PAY:	EARNINGS FOR THIS	JOB:	\$ -
		\$ -	\$	-	\$	-	\$	-	\$	-	\$-	\$-	KANSAS CITY EARNIN	NGS TAX THIS JOB	\$-
	First Name	Last Name	DATE:							Ι					
EMPLOYEE NAME:				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		\$ -		\$ -
OCCUP	ATIONAL TITLE / CLA	SSIFICATION:	_					TOT	AL FRINGE H	HOURS	0.00	1		\$-	\$ -
				Т			1				-		FRINGE PAID TO:	APPROVED PLAN	\$ -
	1101150		GROUP:		SKILL	GROUP:	07175			/				EMPLOYEE	\$ -
WEEK ALL JOBS:	HOURS:	GRUSS EARNINGS:	¢		FICA:		STATE:		LUCAL E-1	AX:	MISC:	©	EARNINGS FOR THIS		\$ - e
		-	ې ا	-	φ	-	Ŷ	-	Ŷ		- پ	ۍ -	KANSAS CITT EARINI	NGS TAX THIS JOB	φ -
	First Name	Last Name	DATE:	MON	TUEO		TUUD	501	0.4.7	01111					TOTAL
EMPLOYEE NAME:	-			MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	U.I. RAIE	FRINGE RATE	TUTAL
ADDRESS:			REG. HRS.								0.00	\$ -	¢	-	\$ -
SOCIAL SECURITY NO -											0.00			-	ۍ - د
OCCLIP	ATIONAL TITLE / CLA	SSIFICATION:	2.0.1.1110.	I			1	TOT	AL FRINGE H	HOURS	0.00		<u> </u>	\$ -	\$ -
			-									J	FRINGE PAID TO:	APPROVED PLAN	\$ -
			GROUP:		SKILL	GROUP:					7			EMPLOYEE	\$ -
WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:		FICA:		STATE:		LOCAL E-T	AX:	MISC:	NET PAY:	EARNINGS FOR THIS	JOB:	\$ -
		\$-	\$	-	\$	-	\$	-	\$	-	\$-	\$-	KANSAS CITY EARNIN	NGS TAX THIS JOB	\$-
	First Name	Last Name	DATE	1						1					
EMPLOYEE NAME:			1	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.					1		1	0.00		\$-	-	\$ -
SOCIAL SECURITY NO .:			D.O.T. HRS.								0.00		\$ -	-	\$-
OCCUP	ATIONAL TITLE / CLA	SSIFICATION:						ТОТ	AL FRINGE H	HOURS	0.00		-	\$-	\$ -
											_	<b>-</b>	FRINGE PAID TO:	APPROVED PLAN	\$
			GROUP:		SKILL	GROUP:								EMPLOYEE	\$ -
WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:		FICA:		STATE:		LOCAL E-T	AX:	MISC:	NET PAY:	EARNINGS FOR THIS	JOB:	\$ -
		\$ -	\$	-	\$	-	\$	-	\$	-	\$ -	\$ -	KANSAS CITY EARNI	NGS TAX THIS JOB	\$ -

Date

(Name of Signatory Party) 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

(Title)

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 ab	ove 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	e United States Code.				

CITY OF FOUNTAINS HEART OF THE NATION



## SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project Number \_\_\_\_\_ Project Title \_\_\_\_\_

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 FO	RCE REPOR	I	
· (     )'	Project Number Project Title Contractor	Day	Date	
NSAS CITY	Subcontractor			

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: (prir	nt)Title: (print)	
Signature:		Page of

1

CITY OF FOUNTAINS HEART OF THE NATION	CERTIFICATE OF SUBSTANTIAL COMPLETION Project Number Project Title
KANSAS CITY MISSOURI	
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.

CONSTRUCTIO	ON MANAGER	BY	DATE
DESIGN PROF	ESSIONAL	BY	DATE
The Contrac days from the	tor will complete or correc e above date of Substanti	t the Work on the list of item al Completion.	is attached hereto within
CONSTRUCTIO	DN MANAGER	BY	DATE
DESIGN PROF	ESSIONAL	BY	DATE
The Owner a possession t	accepts the Work or desiç hereof at	nated portion thereof as sul _ (time) on	bstantially complete and will assume full (date).
OWNER'S REP	PRESENTATIVE	BY	DATE
Distribution:	<ul> <li>Owner</li> <li>Contractor</li> <li>Construction Manager</li> <li>Design Professional</li> <li>Consultant</li> <li>Other</li> </ul>		

CITY	OF	FOU	NTAINS
HEAR	t of	THE	NATION

# 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	Location	Description	Correction/	Verification
No.	(Area)		Completion	Check
			Date	

Attachments

Signed by:

DESIGN PROFESSIONAL (Firm/In House)

Distribution: DOWNER

CONTRACTOR

DESIGN PROFESSIONAL

Consultant

Other

Date:

CIT Hea	Y OF FOUNTAINS Art of the Nation					
(		CONTRACTO	OR AFF	DAVIT FOR FIN	NAL PAYMENT	
•	(       <i>)'</i>	Project Number				
	·Ψ <sup>γ</sup>	Project Title				
К А м	NSAS CITY ISSOURI					
ST.	ATE OF		) )\$\$			
COUNTY OF)						
The Undersigned, of la						
age	e, being first duly swor	n, states under oath as fol	(Na lows:	me)		
1.	I am the		_of		who is the general	
	CONTRACTOR for	(Title) the CITY on Project No.		(CONTRACTOR) and Project Title		
2.	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				

( $\checkmark$ ) \_\_\_\_\_\_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
Supplier\*\* Final Amount:

\*Reference to specification sections or bid item number.

- $(\checkmark)$  \_\_\_\_\_ Met or exceeded the Contract utilization goals; or
- $(\checkmark)$  \_\_\_\_\_ Failed to meet the Contract utilization goals (attach waiver, substitution or modification); or
- $(\checkmark)$  \_\_\_\_\_ 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 (a) 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 (HRD Form 00485.02 and final company-wide workforce monthly report (HRD Form 00485.03) are 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 \$324,000.01. 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 Signatu	re)
	Title	
On this	day of	,, before me
appeared		, to me personally known to be the
	_of the	,
and who executed the foregoin	ng instrument and acknowledged	that (s)he executed the same on behalf of
		as its free act and deed.
IN WITNESS WHEREOF, I written.	have hereunto set my hand and	affixed my official seal on the day and year first above
My commission expires:		

CITY OF FOUNTAINS HEART OF THE NATION	SUBCONTRACTOR AF	FIDAVIT FOR FINAL PAYMENT
	Project Number	
	Designed Title	
KANSAS CITY		
STATE OF MISSOURI	)	
STATE OF MISSOCIA	) ss:	
COUNTY OF	)	
After being duly sworn	the person whose name and signature	e appears below hereby states under penalty of perjury that:
1. I am the duly au affidavit on behalf of Su Subcontractor has comp	thorized officer of the business indic bcontractor in accordance with the r leted all of the Work required under	cated below (hereinafter Subcontractor) and I make this equirements set forth in Section 290.290, RSMo. the terms and conditions of a subcontract as follows:
Subcontract with	h:	, Contractor
Work Performed	1:	
Total Dollar An	nount of Subcontract and all Change	Orders: \$
City Certified List certification	□MBE □ WBE □ DBE □	NA
2. Subcontractor fu in Sections 290.210, RS	ally complied with the provisions and Mo through 290.340, RSMo.	d requirements of the Missouri Prevailing Wage Law set forth
Business Entity Type: () Missouri Corpor () Foreign Corpora	ration	Subcontractor's Legal Name and Address
( ) Fictitious Name ( ) Sole Proprietor	Corporation	
Limited Liabilit	y Company	Phone No.
() Partnership		Fax:
( ) Other (Specify)		E:mail: Federal ID No.
I hereby certify	that I have the authority to execute the	nis affidavit on behalf of Subcontractor.
Der		
By:(Signatu	ire)	(Print Name)
(Title)		(Date)
Subscribed and sworn to	before me this day of	, 20
My Commission Expire	s: By_	
Print Name		Title

# **SECTION 01300 – SUBMITTALS**

## PART 1 - GENERAL

#### 1.01 SUMMARY

- A. This section provides for the submittals required by the City prior to the start of work and, as required, for the duration of the Work.
- B. All submittals shall be clearly identified by reference to a specification section and/or detail drawing. Submittals shall be clear and legible and shall include sufficient presentation of the data.
- C. No portion of the work requiring a shop drawing, product data or sample shall be started nor shall any materials be fabricated or installed prior to the completion of the submittal process described herein. Fabrication performed, purchased materials or on-site construction accomplished prior to completing the submittal process as defined herein shall be at the Contractor or Design-Builder's sole risk. The City shall not be liable for any expense or delay to complete the submittal process.

## 1.02 RELATED SECTIONS

- A. Section 00700 General Requirements:
  - 1. Article 2, paragraph 2.06.B.1 Preliminary Project Schedule.
  - 2. Article 2, paragraph 2.06.B.2 Preliminary Schedule of Shop Drawings.
  - 3. Article 2, paragraph 2.06.B.3 Preliminary Schedule of Values.
  - 4. Article 6, paragraph 6.04 Progress Schedule.
  - 5. Article 6, paragraph 6.05 Recovery Schedule.
  - 6. Article 6, paragraph 6.06 Substitute and "Or-Equal" Items.
  - 7. Article 6, paragraph 6.15 Safety Representative.
  - 8. Article 6, paragraph 6.18 Shop Drawings and Samples.
- 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 01320 Construction Progress Documentation
- I. Section 01322 Photogram Documentation
- J. Section 01335 Document Management.
- K. Section 01664 Training
- L. Section 01757 Commissioning

## 1.03 GENERAL INFORMATION

## A. Definitions:

1. Shop Drawings, product data and Samples are technical Submittals prepared by the Contractor or Design-Builder, Subcontractor, manufacturer or Supplier and submitted by Contractor or Design-Builder to the City for review and comment as a basis of the use of Equipment and Materials proposed for incorporation in the Work or needed to describe installation, operation, maintenance or technical properties, as specified in each Division of the Specifications:

- (a) Shop Drawings include custom-prepared data of all types including drawings, diagrams, performance curves, material schedules, templates, instructions and similar information.
- (b) Product data includes standard printed information on materials, products and systems; not custom-prepared for this Project, other than the designation of selections from available choices.
- (c) Samples include both fabricated and physical examples of materials, products and Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or (where indicated) for more detailed testing and analysis. Mock-ups are a special form of Samples which are too large to be handled in the specified manner for transmittal of Sample Submittals.
- (d) Spare parts: Describe spare parts necessary for the Owner's use in facility operation and maintenance; identify the type and quantity, but include the actual characteristics of the spare parts in Product as part of the specification of the product.
- (e) Tools: Tools are generally defined as items such as special wrenches, gauges, circuit setters, and other similar devices required for the proper operation or maintenance of a system that would not normally be in the Owner's tool kit.
- 2. Informational Submittals are those technical reports, administrative Submittals, certificates and guarantees not defined as Shop Drawings, product data or Samples:
  - (a) Technical reports include laboratory reports, tests, technical procedures, technical records and Contractor or Design-Builder's design analysis.
  - (b) Administrative Submittals are those nontechnical Submittals required by the Contract Documents or deemed necessary for administrative records. These Submittals include maintenance agreements, bonds, project photographs, physical work records, statements of applicability, copies of industry standards, project record data, schedules, security/protection/safety data and similar type Submittals.
  - (c) Certificates and guarantees are those Submittals on Equipment and Materials where a written certificate or guarantee from the manufacturer or Supplier is required in the Contract Documents.
  - (d) Manufacturer's Instructions: Instructions, stipulations, directions, and recommendations issued in printed form by the manufacturer of a product addressing handling, installation, erection, and application of the product; manufacturers' instructions are not prepared especially for the Work.
- B. Quality Requirements:
  - 1. The Contractor or Design-Builder shall submit Shop Drawings and Samples in accordance with Section 00700.
  - 2. Submittals such as Shop Drawings and product data shall be of suitable quality for legibility and reproduction purposes. Every line, character and letter shall be clearly legible. Drawings shall be useable for further reproduction to yield legible hard copies.
  - 3. All submittals by subcontractors shall be sent directly to the Contractor or Design-Builder for checking. The Contractor or Design-Builder shall be responsible for their submission at the proper time to prevent delays.
  - 4. The Contractor or Design-Builder shall check all subcontractors' submittals regarding measurements, sizes, materials and details to determine and verify that they meet the requirements of the Contract Documents. Submittals found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission to the City.

- 5. Certificates of Compliance Where indicated in these specifications, each submittal shall include a certificate of compliance prepared by the manufacturer or Supplier of the submitted data, certifying that the item covered complies with Contract Documents. The certificate of compliance shall be a separate document and shall include identification of all deviations, if any, from the Contract Documents.
- C. Submittal Completeness:
  - 1. The Contractor or Design-Builder shall accept full responsibility for the completeness of each submission. When an item consists of components from several sources, the Contractor or Design-Builder's initial submittal on the item shall include all components.
  - 2. Submittals shall be complete with respect to dimensions, design criteria, materials of construction and other information specified to enable the City or Designee to review the information effectively.
  - 3. Where standard drawings are furnished which cover several variations of the general class of Equipment, each drawing shall be annotated to indicate exactly which parts of the drawing apply to the Equipment being furnished. Use hatch marks to indicate variations that do not apply to the Submittal. The use of "highlighting markers" will not be an acceptable means of annotating Submittals. Annotation shall also include proper identification of the Submittal permanently attached to the drawing.
  - 4. Reproductions or copies of Contract Drawings or portions thereof will not be accepted as complete fabrication or erection drawings. The Contractor or Design-Builder may use a reproduction of Contract Drawings for erection drawings to indicate information on erection or to identify detail drawing references. Whenever the Drawings are revised to show this additional Contractor or Design-Builder information, the Design Professional's title block shall be replaced with Contractor or Design-Builder's title block and the Design Professional's professional seal shall be removed from the drawing. The Contractor or Design-Builder shall revise these erection drawings, as needed, for subsequent Design Professional revisions to the Contract Drawings.
- D. Form of Submittals:
  - 1. Submittals and other Project documents shall be transmitted in electronic format and nonelectronic format as specified.
  - 2. Contractor or Design-Builder shall provide a submittal registry prior to the pre-con meeting that is suitable for upload to the City's Document Management program.
  - 3. Electronic Format:
    - (a) Transmit Submittals and Project documents utilizing:
      - (i) Adobe ".pdf" files created directly from native electronic format or City-approved equal file type and format.
      - (ii) Electronic submittal ".pdf" files are not to be combined files or collections of files/drawings. Each drawing document must stand alone.
      - (iii) Each file will be right reading and oriented the same for all consecutive resubmissions.
      - (iv) For any given Submittal, the filename and format shall be consistent for initial submission and subsequent revisions of the same. Use consistent naming convention throughout. Reference to revision or dates shall not be included in a filename.
      - (v) Files greater than 5 pages shall have table of contents with bookmarks for each section. The Sections shall have easily understood names.
      - (vi) Submittals not meeting the above criteria are subject to rejection.
    - (b) Provide Project Record Documents, equipment instruction books and operating and maintenance manuals and any other documents, as required, in a file type and format approved by City.

01300 - 1-3 of 8 Revised 05-08-20

- 4. Non-electronic Format:
  - (a) Selected Submittals may be provided in paper (hard copy), as well, only with advance approval of the City and using procedures specified herein.
  - (b) Equipment instruction books and operating manuals shall be provided in hardcopies in addition to the specified electronic format.
- E. Transmittal of Submittals:
  - 1. Submittal register shall be uploaded prior the transmission of the first submittal.
  - 2. All submittals, regardless of origin, shall be stamped with the approval of the Contractor or Design-Builder and identified with the name and number of this Contract, Contractor's or Design-Builder's name, references to applicable specification paragraphs and Contract Drawings and version of the submittal. Submittals can be named for their specification if the submittals cover the full scope of work in said specification.
  - 3. 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. The Contractor or Design-Builder's stamp of approval is a representation to the City and Design Professional that the Contractor or Design-Builder accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data, and the Contractor or Design-Builder has reviewed and coordinated each submittal with the requirements of the Work and the Contract Documents.
  - 4. Electronic Submittals The Contractor or Design-Builder shall utilize the City's document management system as specified in Section 01335- Document Management for managing, tracking and storing documents associated with the Project. If an internet-based document management system is to be used, additional requirements are provided in Section 01335- Document Management. The Contractor or Design-Builder shall comply with the file protocols and procedures for the document management system.
  - 5. Approved submittals shall be tagged per City's metadata tagging standard and provided to the City as part of the Electronic O&M Manual.
- F. Submittals Required for the Preconstruction Conference:
  - 1. Following are the minimum required submittals to be provided by the Contractor or Design-Builder at the pre-construction conference:
    - (a) General Requirements:
      - (i) Preliminary Project Schedule including Submittals.
      - (ii) Preliminary Schedule of Values.
      - (iii) Preliminary Submittal Registry.
      - (iv) Listing of Subcontractors.
      - (v) Project Sign Request.
      - (vi) List of Major Equipment utilized.
      - (vii) Safety Representative.
    - (b) Document Management can be found in Section 01335 Document Management.
- G. In order to allow expedited review submittals on the sections or topics below are required to have a pre-submittal meeting:
  - 1. Commissioning Schedule.
  - 2. First Factory Acceptance Test Plan.
  - 3. PLC Programming.

## 1.04 SHOP DRAWINGS AND SAMPLES

- A. Shop Drawings:
  - 1. Shop Drawings and engineering data covering all equipment and fabricated and building materials which will become a permanent part of the Work under this Contract shall be submitted to the City or Designee for review as specified herein. The data shall include drawings, descriptive information, sufficient detail to show the kind, size, arrangement and operation of component materials and devices; the external connections, anchorages and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.
  - 2. All deviations from the Contract Documents shall be identified on each submittal and shall be tabulated in the Contractor or Design-Builder's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by the Contractor or Design-Builder (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.
- B. Product Data:
  - 1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the Work.
  - 2. If applicable, submittals for equipment shall include a listing of all installations where identical or similar equipment has been installed and been in operations for a period of at least one year.
  - 3. Certificates are statements printed on the manufacturer's or supplier's letterhead and signed by responsible officials of manufacturer of product, system or material. Certifications shall provide a clear statement that the product, system or material meets the specified requirements of Contract Documents. All certificates shall be dated after the Effective Date of the contract and shall clearly indicate the project name and project number.
- C. Samples:
  - Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the City or Designee for independent inspection and testing, as applicable to the Work.
- D. Instruction Books and Operating and Manuals:
- 1. Per Section 01021 Operation Maintenance Data
- E. Record Documents
  - 1. Per Section 011019 Closeout Procedures, 01021 Operation Maintenance Data, 01020 Record Documents, 01322 Photographic Documentation

01300 - 1-5 of 8 Revised 05-08-20

## F. Survey Data

- 1. All field books, notes, videotapes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to City for examination throughout the construction period.
- 2. All such data shall be submitted to City with the other documentation required for final acceptance of the Work.

#### 1.05 SCHEDULES

A. 01320 - Construction Progress Documentation

#### 1.06 COMMISSIONING SUBMITTALS

A. Section 01757 Commissioning

#### 1.07 CONSTRUCTION PROGRESS PHOTOGRAPHS AND VIDEOS

- A. Section 01320 Construction Progress Documentation
- B. Photos and Videos documenting assets that will not be visible during the substantial completion walkthrough shall have their record photos taken prior to be obscured by backfill, equipment installation, gypsum board installation, etc... Record photos shall have metadata tags per KC Water standards.

#### 1.08 WARRANTY and BONDS and CLOSEOUT SUBMITTALS

A. Section 011019 Closeout Procedures, Section 00800 Supplementary Conditions, and 00700 General Conditions

#### 1.09 SCHEDULE OF VALUES

- A. The CONTRACTOR shall prepare and submit to the DESIGN PROFESSIONAL for approval by the preconstruction conference, a Schedule of Values for and covering the Lump Sum Price Bid as shown in the Proposal. The Schedule of Values shall show the estimated total number of construction units for each kind of work and the value of each unit.
- B. Each price listed shall include all overhead, other costs, CONTRACTOR's profit and the total estimated value of the items of work listed in the Schedule of Values shall equal the Contract Lump Sum Price covered by the estimate. Overhead and profit are not to be listed as separate items.
- C. An unbalanced schedule of values providing for overpayment of CONTRACTOR on items of Work which would be performed first will not be approved. The Schedule of Values shall be revised and resubmitted until acceptable to the DESIGN PROFESSIONAL & OWNER. Final acceptance by DESIGN PROFESSIONAL shall indicate only consent to the Schedule of Values as a basis for preparation of applications for progress payments and shall not constitute an agreement as to the value of each indicated item.

## 1.10 CITY OR DESIGNEE'S REVIEW OF DRAWINGS AND DATA

A. The City or Designee's review of drawings and data submitted by Contractor or Design-Builder will cover only general compliance with the Construction Contract Documents. The City or Designee's review does not indicate a thorough review of all dimensions, quantities and details of the material, equipment, device or item shown. The City or Designee's review shall not relieve Contractor or Design-Builder of Contractor or Design-Builder's responsibility for errors, omissions or deviations in the drawings and data, nor of sole responsibility for compliance with the Construction Contract Documents.

01300 - 1-6 of 8 Revised 05-08-20

- B. The City or Designee's submittal review period shall be 21 consecutive calendar days in length and shall commence on the first calendar day immediately following the date of arrival of the submittal or resubmittal in the City or Designee's office. The time required to mail the submittal or resubmittal back to Contractor or Design-Builder shall not be considered a part of the submittal review period.
- C. Contractor or Design-Builder may request an expedited review of a limited number of submittals. The City may elect to require a workshop to facilitate this expedited review. A maximum of one workshop per week will be allowed.
- D. Submittals shall be returned to the Contractor or Design-Builder under one of the following assignments:
  - 1. "Approved" is assigned when there are no notations or comments on the submittal. When returned, the Contractor or Design-Builder may release the equipment and/or material for manufacture.
  - 2. "Approved as Noted" is assigned when a confirmation of the notations and comments is not required by the Contractor or Design-Builder. The Contractor or Design-Builder may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
  - "Revise and Resubmit" is assigned when the submittal does not meet the intent of the Construction Contract Documents. The Contractor or Design-Builder must resubmit the document revised to bring the submittal into compliance with Contract Documents. "Revise and Resubmit" is also assigned when notations and comments are extensive enough to require a resubmittal of the package.
  - 4. "Rejected" is assigned when the submittal does not meet the intent of the Construction Contract Documents. The Contractor or Design-Builder must resubmit the entire package revised to bring the submittal into compliance with Contract Documents. It may be necessary to resubmit using a different manufacturer/vendor to meet the Construction Contract Documents. "Rejected" is also assigned when the notations and comments are extensive enough to require a resubmittal of the package.
  - 5. "For Record Only" is assigned when the submittal is provided as a courtesy to the City or as a contractual requirement by the Design-Builder or Contractor. Design-Builder or Contractor has no further action required. Submittal is for supplementary information only; pamphlets, general information sheets, catalog cuts, standard sheets, test reports, manufacturer's or supplier's letters included with submittal data, unmarked catalog data, bulletins and similar data, all of which are useful to Owner in design, operation, or maintenance, but which by their nature does not constitute a basis for determining that items represented thereby conform with the design concept or comply with the intent of the Contract Documents. It is not subject to Owner's review and acceptance, and is being filed for Record Copy purposes only. This is generally used in acknowledging receipt of means and methods of construction work plans, filed conformance test reports, health and safety plans, or structural design by the Design-Builder's or Contractor Engineer of Record, etc.
- E. If the Contractor or Design-Builder considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor or Design-Builder shall give written notice thereof to the City or Designee at least seven working days prior to release for manufacture.
- F. Resubmittal of Drawings and Data:
  - 1. The Contractor or Design-Builder shall accept full responsibility for the completeness of each resubmittal. The Contractor or Design-Builder shall verify that all corrected data and additional information previously requested by the City or Designee are provided on the resubmittal. When corrected copies are resubmitted, the Contractor or Design-

01300 - 1-7 of 8 Revised 05-08-20

Builder shall in writing direct specific attention to all revisions and shall list separately any revisions made other than those called for by the City or Designee on previous submissions.

- 2. 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.) to indicate the sequence of the resubmittal.
- 3. Resubmittals shall be made within thirty (30) days of the date of the letter returning the submittal to be modified or corrected; unless, within 14 days, the Contractor or Design-Builder submits an acceptable request for an extension of the stipulated period, listing the reasons the resubmittal cannot be completed within the specified time.
- 4. Any need for more than one resubmission or any other delay in obtaining the City or Designee's review of submittals, will not entitle the Contractor or Design-Builder to an extension of the Contract Times, unless: the delay of the Work is directly caused by a change in the Work authorized by a Change Order or by failure of the City or Designee to review the submittals within the submittal review period specified herein.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION Not used

END OF SECTION

## SECTION 01320 – PROJECT MANAGEMENT AND 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.
- B. The Contractor or Design-Builder shall furnish all labor, materials, equipment and incidentals as necessary to comply with these requirements including but not limited to the following and as required herein:
  - 1. Preliminary Project Schedule.
  - 2. Project Baseline Schedule.
  - 3. Progress Schedule.
  - 4. Recovery Schedules.
  - 5. Submittals Schedule.
  - 6. Daily Labor Force reports.
  - 7. Material location reports.
  - 8. Field condition reports.
  - 9. Special reports.
  - 10. Commissioning
  - 11. Training
  - 12. O&M Data
  - 13. Electronic O&M Manuals
  - 14. Testing
  - 15. Acceptance Testing
  - 16. Photographic Documentation.

## 1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract; including General and Supplementary Conditions, all applicable Division 01 Sections, and all applicable Division Sections; apply to this Section.
- B. Section 00700 General Requirements:
  - 1. Article 2, paragraph 2.06.B.1 Preliminary Project Schedule.
  - 2. Article 2, paragraph 2.06.B.2 Preliminary Schedule of Shop Drawings.
  - 3. Article 2, paragraph 2.07.A Acceptable Schedule.
  - 4. Article 2, paragraph 2.07.B Project Baseline Schedule.
  - 5. Article 6, paragraph 6.04 Progress Schedule.
  - 6. Article 6, paragraph 6.05 Recovery Schedule.
- C. Section 01000 General Project Requirements.
- D. Section 01019 Closeout Procedures
- E. Section 01020 Record Documents
- F. Section 01021 Operation and Maintenance Data
- G. Section 01140 Work Restrictions
- H. Section 01140.01 Process and System Shutdown Constraints Schedule
- I. Section 01140.02 Operation Change Control Plan Documents
- J. Section 01322 Photographic Documentation.

K. Section 01664 - Training

L. Section 01757 – Commissioning

# 1.03 CODES AND STANDARDS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- B. American Association of Cost Engineers (AACE):
  - 1. Comply with recommended practices.

1.04 SUBMITTALS

- A. Scheduler Qualifications For firms and persons preparing schedules, submit qualifications as required by Table 1 to demonstrate their capabilities and experience. Include lists of completed projects with the following information:
  - 1. Project name.
  - 2. Project location.
  - 3. Name and address of engineer, architect or Contractor or Design-Builder for which schedules were prepared.
  - 4. Name and address of client.
  - 5. Project Duration at Bid & Project Duration.
  - 6. Other information and pertinent.
- B. Preliminary Schedule of Shop Drawings (Submittals) Arrange the following information in a tabular format or a format that is compatible with entry into the City's document management system:
  - 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. If a Pre-Submittal Workshop is required
  - 7. If the Contractor or Design-Builder will request expedited review.
  - 8. Scheduled date for City's final approval.
- C. Standard Schedule Format Layout for all schedules and reports shall follow the standard format in the following order, activity ID, activity name, original duration, remaining duration, percent complete, start, finish, late start, late finish, total float, baseline variance, predecessor, successor, and resource ID.
- D. Preliminary Project Schedule (Design-Build Only) Submit in native electronic format and \*PDF format. PDF sheet size shall sufficiently large enough to legibly show entire schedule for entire construction period.
  - 1. Include:
    - (a) CPM Report
    - (b) Native File
- E. Baseline Project Schedule Submit in native electronic format and \*PDF format. PDF sheet size shall sufficiently large enough to legibly show entire schedule for entire construction period.
  - 1. Include:
    - (a) CPM Report
    - (b) Resource Loaded
    - (c) Native File

01320 – 2 of 15 Revised 02-24-20

- F. Progress Schedules Submit in native electronic format and \*PDF format. PDF sheet size shall sufficiently large enough to legibly show entire schedule for entire construction period.
  - 1. Include:
    - (a) CPM Report
    - (b) Activity report
      - (1) A list of all activities sorted by activity number and early start date, or actual start date, if known.
    - (c) Logic Report
      - (1) A 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.
    - (d) Total Float Report
      - (1) A list of all activities sorted in ascending order of total float.
    - (e) Daily Labor Force Report
    - (f) Material Location Report
    - (g) Field Condition Report
    - (h) City may request a cost and resource loaded schedule if the project has insufficient float or multiple overlapping critical paths.
- G. Commissioning Schedule Section 01757 Commissioning
- H. Special Reports Submit special reports within one day of an occurrence.
- I. Daily Construction Reports Submit at weekly intervals.
- J. Four Week look ahead Schedules provided at each progress meeting that indicate with work activities will be occurring over the next 4 weeks and what was accomplished the previous week.
  - 1. The activity designations used in the four week look ahead must be consistent with those used in the baseline schedule and the monthly schedule updates.

# 1.05 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 start and finish times.
- 3. Predecessor activity is an activity that must start or complete before a given activity can be started. No negative lag is allowed.
- 4. Successor activity is an activity that can not start until the predecessor activity allows it. No negative lag is allowed.
- B. Cost Loading: All WBS summary activities are cost loaded. The sum total of all cost loaded activities shall equal the total Contract Price of the Contract, including Owner-approved change orders. This shall be equivalent to the total of the Schedule of Values for the Project.
- C. CPM (Critical Path Method) 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. 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.

01320 - 3 of 15 Revised 02-24-20

- D. 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-on-or-before imposed date schedule constraint.
- E. Event The starting or ending point of an activity.
- F. Float The measure of leeway in starting and completing an activity. Float time is not for the exclusive use or benefit of either City or Contractor or Design-Builder, 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.
- G. Fragnet A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. 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.
- I. Lag An offset or delay from an activity to its successor. It is based on the calendar of the successor activity.
- J. Major Area A significant construction element.
- K. Major Procurement As discussed in Section 00700, paragraph 2.07.B.1, Major Procurement shall further defined as any materials that fall within the critical path and/or have a lead time of 30 days or greater.
- L. Milestone A key or critical point in time for reference or measurement.
- M. Network Diagram A graphic diagram of a network schedule, showing activities and activity relationships.
- N. Schedule Level –

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. City must approve of any activities greater than 1 week duration.

- O. WBS (Work Breakdown Structure) 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.
- P. 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.
- Q. Resource Loading: WBS activities has the allocated resources necessary to complete the WBS.
- R. Schedule of Monthly Payments Estimated monthly progress payments based on Baseline Schedule and Schedule of Values for each Month for the duration of the project.
- S. City Activity: an activity required by the project that will be performed by the City or their designee outside the contract.

# 1.06 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities including the scheduling and reporting of separate Contractor or Design-Builders performing construction activities related to project.
- B. Coordinate Progress Schedules with the Schedule of Values, to estimate a Schedule of Monthly Payments, list of subcontractors, Preliminary Schedule of Shop Drawings and Samples, progress reports, Application for Payment, and other required schedules and reports.
- C. Secure time commitments for performing critical elements of the Work from parties involved. Time commitments should be captured within the schedule.

# 1.07 TRAINING SCHEDULE:

- A. Contractor Shall provide a draft list of training sessions arranged in chronological order along with the submittal Schedule
- B. Contractor shall provide a draft list of training sessions arranged in chronological order along with the submittal schedule.
- 1.08 Contractor shall send an updated training schedule every 3 months, and Contractor shall indicate which training sessions are tentative or firmly scheduled. SCHEDULE LEVEL
   A. If a Recovery Schedule is deemed necessary by the City in accordance with Section 00700 General Conditions, it shall be developed as a cost and resource loaded schedule.

## 1.09 SCHEDULING SOFTWARE

A. Prepare schedules using the latest version of Primavera version P6 or higher or Microsoft Project.

## 1.10

# PRELIMINARY SCHEDULE OF SHOP DRAWINGS AND SAMPLES

- A. Preparation Provide a schedule of submittals 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.
- B. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, the estimated Schedule of Monthly Payments, and Progress Schedules.
- C. Include Shop Drawing and Sample 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.
- D. At Contractor or Design-Builder's option, show submittals on the Preliminary Progress Schedule, instead of tabulating them separately.

# 1.11 SCHEDULE REQUIREMENTS

A. Requirements According to Schedule Level – Contractor or Design-Builder shall provide the following information.

Item	Requirement
Procedures	Comply with procedures contained the American Association of Cost Engineers (AACE) recommended practices.
Time Frame	Extend project schedule from date established for the Notice to Proceed to the date of Final Completion.

Item	Requirement		
Contract Times	Contract Times shall not be changed unless specifically authorized by Change Order.		
Activities	Treat separate major areas as a separate numbered activity for each principal element of the Work. (WBS)		
Activity Duration	Define activities so none is longer than 7 days, unless specifically allowed by City		
Milestones	Include milestones indicated in the Contract Documents in schedule, including, but not limited to, all zero duration events, the Notice to Proceed, Substantial Completion, and Final Completion.		
Computer Software	Prepare schedules using the latest version of Primavera version P6 or higher or Microsoft Project.		
Scheduler's Qualifications	Submit scheduler's qualifications for review and approval		
Submittal Review Time	Include review and re-submittal times for review of Shop Drawings and Samples. Each item listed in the Preliminary Schedule of Shop Drawings and Samples shall be included in the schedule.		
Procurement Activities	Include separate activities for the procurement process of long-lead and major items that require a cycle of more than 30 days or fall within the critical path. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.		
Startup and Testing Time	See Sections -01757 Commissioning, 01664 Training. Incorporate all these requirements with appropriate lead times into the project schedule.		
Phasing	Arrange list of activities on schedule by phase.		
Submittal Review Time	Include review and re-submittal times for review of Shop Drawings and Samples. Each item listed in the Preliminary Schedule of Shop Drawings and Samples shall be included in the schedule.		
City Activities	Include a separate activity for each area of the Work performed by City and a separate activity for notifying the City if contractually required or requested.		
Products Ordered in Advance	Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.		
City-Furnished Products	Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.		
Work Restrictions	<ul> <li>Show the effect of the following items on the schedule:</li> <li>Coordination with existing construction.</li> <li>Limitations of continued occupancies.</li> <li>Uninterruptible services.</li> <li>Partial utilization before Substantial Completion.</li> <li>Use of premises restrictions.</li> <li>Provisions for future construction.</li> <li>Seasonal variations.</li> <li>Environmental control.</li> </ul>		
Work Stages	Work, including, but not limited to, the following:		

Item	Requirement		
	<ul> <li>Subcontract awards.</li> <li>Submittals.</li> <li>Purchases.</li> <li>Fabrication.</li> <li>Sample testing.</li> <li>Deliveries.</li> <li>Installation.</li> <li>Tests and inspections.</li> <li>Adjusting.</li> <li>Curing.</li> <li>Startup and placement into final use.</li> </ul>		
Area Separations	Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities: Contractor Mobilization* Procurement – Divided by Long Lead and Short Lead Completion of civil work Completion of structural work Completion of structural work Completion of architectural work Completion of mechanical installation Completion of electrical installation Completion of I&C installation Completion of I&C programing Partial Utilization Substantial Completion* Start of Acceptance Testing Achievement of Full Operations* Punch List and Final Corrections* Final Completion*		
Contract Modifications	For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.		
Work under More than One Contract or Subcontract.	Include a separate activity for each contract or subcontract.		
Detailed by Work Package	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		
Detail by Task	Include detail by task to support the short-term planning for the field, normally for those activities of less than 1-week duration.		

#### B. Cost Correlation:

1. At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

## PRELIMINARY AND BASELINE PROJECT SCHEDULES

- A. 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.
- B. Preliminary Network Diagram Outline significant construction activities for the project. To be submitted with the Preliminary Progress Schedule.
- C. Cost Loaded
- D. Baseline Schedule shall be resource loaded.

# 1.13 PROGRESS REPORTS AND SCHEDULES

- A. General Prepare Progress Schedules using a CPM network analysis diagram and be cost loaded.
- 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 or 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.

01320 - 8 of 15 Revised 02-24-20

Kansas City, Missouri Water Services Department Standard Specification

1.12

- 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 logic ties.
  - (c) Changes in early and late start dates.
  - (d) Changes in early and late finish dates.
  - (e) Changes in activity durations in days.
  - (f) Changes in the critical path.
  - (g) Changes in total float or slack time.
  - (h) Changes in the Contract Time.
  - 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 last 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. Reports:

C.

1.

6.

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 or Design-Builders at Project site.
- (c) List of all the Contractor or Design-Builder's and subcontractor's personnel showing hours worked in labor class at Project site.
- 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.
- Field Condition Reports Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit electronically and directly to City with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Special Reports:

1. General – Submit special reports within one day of an 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 or Design-Builder's personnel; evaluation of results or effects; and similar pertinent information. Advise City in advance when these events are known or predictable.

01320 – 9 of 15 Revised 02-24-20

#### SCHEDULE OF VALUES

A. Requirements for Schedule of Values are specified in Article 2.1.3 of the General Conditions.

# PART 2 - PRODUCTS

Not used.

# PART 3 - EXECUTION

## 3.01

1.14

## PROGRESS SCHEDULES

- A. Updates At monthly intervals, update schedule to reflect actual construction progress and activities. Progress Schedule should be provided for review and approval prior to monthly pay request at a mutually agreed upon date each month to enable the City's review to be complete by the agreed upon monthly pay application date. Progress Schedules will be reviewed and discussed at regularly schedule progress meetings. Contractor or Design-Builder shall bring printed copies of CPM Schedule:
  - 1. Revise schedule immediately after an activity revision has been recognized or made at the direction by the City. Issue updated schedule concurrently with the report of each such progress 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.
  - 4. Post copies in Project meeting rooms and temporary field offices.

# 3.02 MEETINGS

A.

- Pre-Commencement Meeting for Design-Build Projects :
- 1. In accordance with Article 2.1.1 of the General Conditions, Contractor or Design-Builder shall schedule and conduct a Pre-Commencement Meeting with Owner. This meeting is separate from the Preconstruction Conference and is intended to discuss issues affecting the administration of the Work and to implement the necessary procedures, including those relating to schedules, communication protocols, precise roles and responsibilities of individuals, HRD submittals, and payment, to facilitate the ability of the parties to perform their obligations under the Contract Documents.
- 2. Review Payment Procedures as discussed in Contract Documents.
- 3. Review scheduling requirements. These include but are not limited to schedule preparation, reporting requirements, manpower and equipment loading, updates, revisions, and schedule delay analysis. Contractor or Design-Builder shall present their schedule methodology, planned sequence of operations, resource loading methodology, and proposed activity coding structure.
- 4. Mobilization and Engineering Schedule, Proposed Baseline Schedule, and Proposed Schedule of Values will also be reviewed, if desired by Contractor or Design-Builder.
- 5. Minutes: Contractor or Design-Builder shall distribute meeting minutes 1 business day after the meeting.

01320 - 10 of 15 Revised 02-24-20

#### B. Preconstruction Conference:

1.

- Contractor or Design-Builder will schedule the Preconstruction Conference to occur before the start of general construction at a time convenient to Owner. Hold the conference at Project site or another convenient location. If Baseline Schedule is not ready for discussion at Preconstruction Conference, Owner and Contractor or Design-Builder may modify, for the purpose of discussion at the Conference, the Mobilization and Engineering Schedule for early construction activities with defined scope and budget.
- (a) Attendees: Authorized representatives of Owner, Owner's Advisor, Design Professional, Contractor or Design-Builder Key Personnel, major Subcontractors and others as appropriate shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- (b) Agenda: Discuss items of significance that could affect progress, including the following:
  - (1) Owner, Owner's Advisor, Design Professional, and Contractor or Design-Build team member contacts, roles, responsibilities, communication requirements.
  - (2) Distribution of Contract Documents.
  - (3) Submission of Owner-approved updated Subcontractors and Major Material Suppliers List, Schedule of Values, and Baseline Schedule if changed from Pre-Commencement Meeting
  - (4) Schedules and Milestones.
  - (5) Contractor or Design-Builder work zone and office trailer locations.
  - (6) Procedures: Includes change management, document controls, schedule management, submittals management, and RFIs.
  - (7) Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and contract closeout procedures.
  - (8) Project Record Document Requirements.
  - (9) Review of startup requirements and procedures.
  - (10) Lockout/tagout procedures and requirements.
  - (11) Use of the premises.
  - (12) Contractor or Design-Builder and Owner will discuss additional areas for Contractor or Design-Builder access.
  - (13) Responsibility for temporary facilities and controls including designation of person responsible for traffic control in accordance with Section 01500 -Temporary Facilities, and 01700 Traffic Control
  - (14) Standard vehicle traffic onsite.
  - (15) Parking availability.
  - (16) Equipment deliveries and priorities.
  - (17) OCCPs.
  - (18) Project site safety requirements (safety vests, OSHA), and first aid.
  - (19) Plant/site Security/Access Procedures.
  - (20) Progress cleaning.
  - (21) Meetings.
  - (22) Working hours.
- (c) Minutes: Contractor or Design-Builder shall record minutes and distribute electronic copies within 1 business days after meeting to participants, with copies to Contractor or Design-Builder, Owner, and those affected by decisions made.

- 2. Prior to Preconstruction Conference, Contractor or Design-Builder shall have submitted the following deliverables for discussion at meeting:
  - (a) Proposed Baseline Schedule.
  - (b) Mobilization and Engineering Schedule (modified as discussed above).
  - (c) Photo and Video Documentation Plan.
  - (d) Construction Safety Plan.
  - (e) List of Operational Change Control Plans lasting longer than one week.
  - (f) Quality Management Plan.
  - (g) Qualifications of Scheduler, Photographer, and any others as required by Specifications.
  - (h) And any other deliverables required by Specifications.
    - Monthly Progress Meetings:

C.

- 1. Contractor or Design-Builder will schedule and administer formal progress meetings throughout progress of the Work at maximum monthly intervals with the first meeting scheduled approximately 30 calendar days after the Preconstruction Conference.
- 2. Contractor or Design-Builder will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- 3. Contractor or Design-Builder shall provide printed copies of latest submitted progress schedules and Schedule Update.
- 4. Attendance Required: Owner, Owner's Advisor, Design Professional, Contractor or Design-Builder's Project Manager, Contractor or Design-Builder's Construction Manager (if different than the Project Manager), as appropriate to agenda topics for each meeting.
- 5. Agenda shall be reoccurring and approved by Owner. Topics shall include:
  - (a) Review minutes of previous meetings.
  - (b) Review of Work progress and future Work.
  - (c) Review of safety record/events.
  - (d) Risk register/log.
  - (e) Change orders.
  - (f) Quality control.
  - (g) Pay application.
  - (h) Schedule reports.
  - (i) Discuss Stored Material for which the Contractor or Design-Builder will be requesting payment.
  - (j) Commissioning.
- 6. Minutes: Contractor or Design-Builder will record changes for update and distribute electronic copies within 7 calendar days after meeting to participants and file on Owner's document management system.
- Weekly Coordination Meetings:
- 1. Upon start of construction, Contractor or Design-Builder will schedule and administer meetings throughout progress of the Work at maximum weekly intervals.
- 2. Contractor or Design-Builder will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- 3. Attendance Required: Owner, Owner's Advisor, Design Professional, Contractor or Design-Builder's Project Manager, Contractor or Design-Builder's Construction Manager (if different than the Project Manager), Commissioning Manager, superintendents, major subcontractors and suppliers as appropriate to agenda topics for each meeting.
- 4. Agenda:

01320 – 12 of 15 Revised 02-24-20

D.

- (a) Review of Work progress.
- (b) Field observations, problems, and decisions.
- (c) Identification of problems delaying planned progress, hazards and risks.
- (d) Review of critical submittals.
- (e) Deviations in the previous week's 4-Week Schedule.
- (f) Review of critical RFIs, change documents, issues and action items.
- (g) Review of upcoming OCCPs within 3-week window.
- (h) Review of offsite fabrication and delivery schedules.
- (i) Maintenance of Baseline Schedule.
- (j) Corrective measures to regain projected schedules.
- (k) Review 5-Week Schedule and planned progress during succeeding work period.
- (1) Schedule Update, if required in accordance with Paragraph 3.02.
- (m) Coordination of projected progress.
- (n) Maintenance of quality and work standards.
- (o) Effect of proposed changes on Baseline Schedule and coordination.
- (p) Any requests for stored materials payment
- (q) Other business relating to Work.
- 5. Contractor or Design-Builder will record minutes and distribute electronic copies within 1 calendar day after meeting to participants and those affected by decisions made.
- E. Daily Coordination Meeting: Upon start of construction, Contractor or Design-Builder shall hold daily informal meetings with the Owner to discuss planned daily activities by the Contractor or Design-Build team and Owner staff. Owner may elect to merge this meeting with the Division's regular morning meetings.
- F. OCCP Coordination Meetings:
  - 1. Contractor or Design-Builder shall schedule and coordinate with Owner oneweek prior to implementation of approved OCCP.
  - 2. Agenda:
    - (a) Review Approved OCCP.
    - (b) Review safety requirements and preparations.
    - (c) Review contingency plans.
    - (d) Confirm resource availability for execution of OCCP.
  - 3. Contractor or Design-Builder may request and coordinate additional meetings with Owner as necessary to facilitate completion and approval of draft OCCPs. Owner will make reasonable effort to accommodate Contractor or Design-Builder but prefers minimum one week notice.
- G. Pre-Installation Conferences:
  - 1. Conduct a Pre-Installation Conference at Project site before each construction activity that requires coordination with other construction or moving heavy equipment within reach of the railroad. Work around railroads shall be coordinated in accordance with Section OR-01500 Temporary Facilities.
  - 2. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner of scheduled meeting dates.
  - 3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - (a) Contract Documents.
    - (b) Options.
    - (c) Related Change Orders.

01320 – 13 of 15 Revised 02-24-20

- (d) Purchases.
- (e) Deliveries.
- (f) Submittals.
- (g) Possible conflicts.
- (h) Compatibility problems.
- (i) Time schedules.
- (j) Weather limitations.
- (k) Manufacturer's written recommendations.
- (l) Warranty requirements.
- (m) Compatibility of materials.
- (n) Acceptability of substrates.
- (o) Temporary facilities and controls.
- (p) OCCPs.

4. 5.

J.

1.

- (q) Space and access limitations.
- (r) Regulations of authorities having jurisdiction.
- (s) Testing and inspecting requirements.
- (t) Required performance results.
- (u) Protection of construction and personnel.
- Record significant conference discussions, agreements, and disagreements.
- Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- H. Expedited Submittal Review Meetings: To expedite the submittal process and accelerate the delivery schedule for equipment with long delivery lead times, expedited submittal review meetings may will need to be held for equipment identified by the Contractor or Design-Builder. Contractor or Design-Builder shall identify such meetings on Baseline Construction Schedule and coordinate the meetings as needed.
- I. Required Submittal Review Meetings: Work in the following Specifications shall require a workshop prior to submittals in order to streamline the review process.
  - (a) None
  - Other Meetings as Required:
  - Maintenance Workshop(s):
  - (a) Purpose: Develop the work orders for new and modified assets with the Owner. Contractor or Design-Builder shall review Original Equipment Manufacturer (OEM) O&M manual maintenance recommendations with Owner. Maintenance activities (Preventive & Predictive) will be divided between operations and maintenance. The updated round sheets for the site(s) will be reviewed for deficiencies. Contractor or Design-Builder shall facilitate a discussion of which OEM recommended maintenance activities have value after the warranty period. If necessary, the Contractor or Design-Builder and Owner will develop additional maintenance activities not recommended by the OEM with a particular focus on predictive maintenance activities such as vibration testing, lubricant testing, and IR testing to support the Owner's reliability centered maintenance program. Maintenance activity frequency will also be discussed. Lubrication for assets will be discussed with a focus on minimizing new lubricants that will need to be stocked.
  - (b) Scheduling: Meetings shall occur after OEM manuals have submitted and approved.

- 2. Sequence of Operations Meeting(s):
  - (a) Schedule: During design, after draft sequence of operations are completed.
  - (b) Purpose: Walk Owner's operations staff and engineering staff through the proposed sequences of operation to control equipment and processes and solicit comments and refinements.
- 3. Facility Data Workshop:
  - (a) Purpose: Any points communicated to a PLC and not SCADA will be discussed. Alarm set point and priority will be reviewed and developed. Historian settings for each point will also be developed or reviewed.
  - (b) Scheduling: After draft sequence of operations is completed and finalized PIDs.

O&M Data Meeting

4.

- (a) 90 days prior to Substantial Completion, a meeting will be held to discuss the steps to prepare the O&M Data for transmittal to the City.
- 5. Spare Parts Coordination Meeting
- 6. Commissioning meetings as required in Section 01757 Commissioning.

# END OF SECTION

HEART OF THE NATION			
	DAILY FIELD OBSERVATION REPORT		
`\ [[[[] ]'	Project Number		
(II)	Project Title		
KANSAS CITY	Contractor		
	Report Number	Date	Time
Weather Clear Snow Overcast Fogg Rain Cold	Site Con Warm Clear Hot Muddy Temperature Range	ditions □ Dusty / □	_Day □ Monday  □ Thursday □ Tuesday  □ Friday □ Wednesday □
Persons Contacted:			
Work Observed:			
Items Discussed:			
Materials Delivered:			
Requested Revisions	or Interpretations:		
Nonconforming Work	Reported This Date To Cont	ractor:	
Remarks:			
□ Attachments			
Signed by:			Date:
Distribution:  Owner Contrac Constru Design Consult	tor ction Manager Professional ant		

Other \_\_\_\_\_

CITY OF FOUNTAINS

CITY OF FOUNTAINS Heart of the Nation			
	PERIODIC I	FIELD OBSERVA	FION REPORT
	Project Number		
·Ψ <sup>ν</sup>	Project Title		
KANSAS CITY MISSOURI	Contractor		
	Report Number	Date	Time
WeatherClearSnowOvercastFoggyRainCold	Sit Warm D Hot D Temperature Ra	te Conditions Clear           Dusty Muddy ange	<u>Day</u> □ Monday □ Thursday □ Tuesday □ Friday □ Wednesday □
Persons Contacted:			

Work Observed:

Items Discussed:

Remarks:

Attachments

Signed by:

Distribution: Downer

- ContractorConstruction Manager
- Design Professional

Consultant

Other \_\_\_\_\_

Date:

Signed by CONTRACTOR

01320.03 Weekly Report of Working Days 050113

# WEEKLY REPORT OF WORKING DAYS

Project Title

Project Number

KANSAS CITY MISSOURI

CITY OF FOUNTAINS HEART OF THE NATION

Report Number \_\_\_\_\_ Week Ending: \_\_\_\_\_

Contractor \_\_\_\_\_

DATE:	WORKING DAY		REM	IARKS	
TOTAL	THIS WEEK	PREVIOUSLY	TOTAL TO DATE	WORKING DAYS IN CONTRACT	REMAINING OR OVERTIME

Signed by OWNER'S REPRESENTATIVE

Date:

Date:

**Contract Central** 

# SECTION 01322 - PHOTOGRAPHIC AND VIDEO DOCUMENTATION

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. This Section outlines the requirements for photographic and video documentation. The Contractor/Design-Builder is solely responsible for the development of an overall plan to fully document Site conditions and the progress of the Work.
- B. The Contractor/Design-Builder shall hire a professional photographer to provide the services and deliverables described herein.
- C. This section does not include work associated with internal closed-circuit television (CCTV) inspections of sewer gravity pipes. See Section 02686 CCTV Inspection of Sewer Mains.

#### 1.02 RELATED SECTIONS

- A. Section 00700 General Conditions.
- B. Section 01015 Specific Project Requirements.
- C. Section 01300 Submittals.
- D. Section 01019 Closeout Procedures
- E. Section 01021 Operation and Maintenance Data
- F. Section 01664 Training
- G. Section 01757 Commissioning
- H. Section 01320 Construction Progress Documentation.
- I. Section 01335 Document Management.
- J. Section 02686 CCTV Inspection of Sewer Mains.

#### 1.03 DEFINITIONS

- A. Pre-Construction Video: A video taken to document Site(s) conditions prior to the start of construction.
- B. Pre-Construction Photographs: 360 Degree photographs taken to document Site conditions prior to the start of construction. All Pre-Construction Photographs shall be digital, indexed on an interactive map and shown on a View Location Map.
- C. Construction Progress Photographs: 360 Degree digital photographs taken to document the progress of construction.
- D. Construction Activity Photographs: Digital photographs taken to document specific construction activities.
- E. Post-Construction Photographs: Digital photographs taken after final restoration to document the finished condition of the Site.
- F. Record Photographs: Digital Photographs of all assets effected by the project. Photos taken after Substantial Completion are preferred for assets that are visible then obscured by the project. Assets obscured during the project will have their record photos taken as needed throughout the project.
- G. Affidavit of Authenticity: The photographer's signed and notarized affidavit, attesting to the production of the original photographs, videos and their authenticity.

## 1.04 SUBMITTALS

- A. Submit as specified in Section 01300 Submittals.
- B. Other required Submittals:

01322 - 1 of 8 Revised 06/26/20

- 1. Photographer's Qualifications: Submit for review and approval the qualification information demonstrating the photographer meets the requirements of paragraph 1.06 of this Section.
- 2. Phasing Plan: If applicable, submit for review and approval a phasing plan for Pre-Construction Photographs and Videos.
- 3. Pre-Construction Photographs: Submit for review and approval digital pre-construction photographs with an interactive index map, Photograph Navigation System (see paragraph 2.05 of this Section) and affidavit of authenticity.
- 4. Pre-Construction Video: Submit for review and approval a pre-construction video with a Video Navigation System (see paragraph 2.05 of this Section) and affidavit of authenticity (see paragraph 1.04 of this Section).
- 5. Construction Progress Photographs: On a monthly basis, submit digital construction photographs, interactive index map and affidavit of authenticity.
- 6. Construction Activity Photographs: On a monthly basis, submit digital activity photographs (if different than progress photographs), interactive index map and affidavit of authenticity.
- 7. Record Photographs: Maintain an active directory of tagged Record Photographs by asset.
- 8. Post-Construction Photographs/Video: Submit for review and approval digital postconstruction photographs or video, interactive index map and affidavit of authenticity.

# 1.05 QUALITY ASSURANCE

- A. The Contractor/Design-Builder is responsible for the quality assurance and quality control of the Work.
- B. General Quality: Photographs and video shall be clear and of sufficient quality to show relevant detail. They shall not be blurred, taken in shadow or too far away to provide conclusive information. The City may require that the photographs or video be retaken should the quality be insufficient. Costs for such re-takes are the Contractor/Design-Builder's sole responsibility and shall be done at no extra cost to the City.
- C. Qualifications of Photographer: The Contractor/Design-Builder shall engage the services of a professional photographer with a minimum of 3 years of experience in construction photography to document the conditions of the project site. Upon request, samples of the photographer's prior work and/or references shall be submitted.
- D. Affidavit of Authenticity: The Contractor/Design-Builder shall provide the photographer's signed and notarized affidavit, attesting to the production of the original photographs, videos and their authenticity. An affidavit of authenticity shall be provided with each submittal/deliverable.

# 1.06 MINIMUM REQUIREMENTS

A. The section specifies several different sets of photographic and video documentation requirements. The extent of documentation will depend upon the size and type of the project. The following table summarizes the basic documentation requirements.

Set of Documentation	Mandatory
Pre-Construction Video	✓
Pre-Construction Photographs	✓
Interactive Index Map	✓
Construction Progress/Activity Photographs	✓

Set of Documentation	Mandatory
Record Photos	$\checkmark$
Post-Construction Photographs/Video	$\checkmark$

## 1.07 OWNERSHIP

A. The photographs and videos shall become the sole property of the City.

## 1.08 SCHEDULES

- A. Schedule of Values: Photographic/Video documentation shall be listed as one line item in the Schedule of Values.
- B. Construction Progress Documentation: Each set of photographs or videos shall be listed in the Preliminary Project Schedule as a discrete activity. See Section 01320 Construction Progress Documentation.

## 1.09 PHASING

- A. Based on the nature and scope of the Work, the Contractor/Design-Builder may phase the Pre-Construction Photographs and Video if pre-approved by the City's Representative. If phasing is to be implemented, the following shall apply:
  - 1. The Contractor/Design-Builder shall submit a Phasing Plan that identifies each area of the Work.
  - 2. For each phase, Pre-Construction Photographs and Videos shall be taken within 21 days of the start of construction activities unless otherwise approved in writing by the City's Representative.
- B. Under no circumstances shall construction begin in any area until the Pre-Construction Photographs and/or Video have been submitted and approved by the City or Designee.

# PART 2 - PRODUCTS

# 2.01 PHOTOGRAPH QUALITY

- A. Photographic images shall be captured in digital format, with a minimum of 10-megapixel resolution and taken without JPG compression.
- B. Each photograph shall include a date/time stamp in the image, showing when the image was taken.

## 2.02 VIDEO QUALITY

- A. All video recordings shall be captured in full 1080-dpi Hi-Definition digital format, without compression or file-reduction whether applied in-camera or after capture during editing.
- B. The original video segments shall be retained in the format captured in camera (such as MP4) without compression or modification that would reduce resolution or quality. The video shall include a date/time stamp in the image, showing when the image was taken. Video shall include verbal description and narrative of what is being captured.

## 2.03 METADATA

- A. Digital files for photographs (Non-Record Photos) and videos shall, at a minimum, contain the following metadata:
  - 1. Project Name.
  - 2. Project Area
  - 3. Date and Time Taken.

01322 – 3 of 8 Revised 06/26/20

- 4. All other metadata inherently provided by the camera/video equipment.
- B. Record Photos shall be metadata tagged per the City's Record File Tagging.

# 2.04 MEDIA LOG

- A. The Contractor/Design-Builder shall maintain a media log (photographs and videos) for the project. The log shall include, but is not limited to, the following information for each photograph and/or video:
  - 1. Project Name.
  - 2. Project Number.
  - 3. Contract Number.
  - 4. Name of City and Department.
  - 5. Name of Contractor/Design-Builder.
  - 6. Name of Design Professional.
  - 7. Photograph file name (the specific format should be tied to the project name). Photograph file name shall be unique to each digital file and shall be embedded in the digital image in a manner that is permanent and clearly legible when the file is opened.
  - 8. Include a date designator in file names.
  - 9. Date the photograph was taken.
  - 10. The name of the photographer who took the photograph.

# 2.05 PHOTOGRAPH AND VIDEO NAVIGATION SYSTEM

- A. The Contractor/Design-Builder shall provide an electronic photographic and video navigation system (navigation system) for searching and viewing recorded imagery.
- B. Interactive Index Map: The navigation system shall indicate the general location of each area photographed or video recorded using icons and other suitable mark-ups on the actual construction drawings in PDF-format. The map shall be filterable by project area, system, and sub-system.
- C. The navigation system shall utilize standard PDF-reader software (such as Adobe Reader, Acrobat, or Bluebeam Vu) or other software that shall be included with the deliverables. Icons shall be individually hyperlinked to the respective photograph, video, affidavit of authenticity and media log file for immediate playback in Windows Media Player, VLC or other players.
- D. The navigation system shall include the following:
  - 1. Project Name.
  - 2. Project Number.
  - 3. Contract Number.
  - 4. Name of City.
  - 5. Name of Contractor/Design-Builder.
  - 6. Name of Design Professional.
  - 7. Ranges of dates for which the photographs or videos were taken.
  - 8. Facility
  - 9. System
  - 10. Sub-System
  - 11. Asset if intelligible
  - 12. The name of the photographer.
  - 13. Affidavit of Authenticity.
  - 14. Media Log.
  - 15. Photographs.
  - 16. Videos.
- E. A navigation system shall be provided for each set of photographs and videos taken.

01322 - 4 of 8 Revised 06/26/20

## PART 3 - EXECUTION

## 3.01 PRIOR TO PHOTOGRAPHIC AND VIDEO DOCUMENTATION

- A. Construction Limits: Prior to the Pre-Construction Photographs and Video, the Contractor/Design-Builder shall flag or mark the construction limits and excavation.
- B. Mark Utilities: Prior to the Pre-Construction Photographs or Video, the Contractor/Design-Builder shall notify utilities and have them marked so that utility locations are documented.
- C. Coordinate with City to be present during the Pre-Construction Photos; the Contractor/Design-Builder shall provide the City a minimum of 2 days' notice.

## 3.02 PRE-CONSTRUCTION VIDEO

- A. Scope: Prior to the start of construction, the Contractor/Design-Builder shall prepare a color video recording with audio of all the areas to be affected by construction. All preconstruction video recordings shall have sufficient detail to reveal the condition (including defects and damage) of all existing features, such as pavement, driveways, culverts, inlets, sidewalks, landscaping, vegetation, creek banks, trees, structures, foundations and other such items along the construction route and in the immediate adjacent areas, which might be affected by the construction operations. In addition, the videographer shall move beyond the construction zone as needed to ensure documentation of features and areas that may not be adequately recorded from the centerline rotations. Videos shall be taken on both sides of the street when construction is in or along a roadway (use this approach along drainage channels and in other similar situations).
- B. Schedule: Taken after utilities and other underground structures/assets have been marked and prior to the placement of materials or equipment on the Site. Videos shall be submitted to the City for review and approval. Under no circumstances shall construction begin until the pre-construction video has been submitted and approved.
- C. The pre-construction video recording shall be done in the presence of a representative of the City.
- D. The Contractor/Design-Builder shall document all pre-existing site conditions/elements of the Site, the same as listed for the Pre-construction Photographs.
- E. The video documentation shall provide a clear and continuous view of the project showing all visible utilities and features within the limits of construction.
- F. To preclude the possibility of tampering or editing in any manner, all video recordings shall, by electronic means, generate and display continuously and simultaneously on the screen or in the video file metadata properties digital information to include the date and time of recording. The time information shall consist of hours, minutes and seconds, separated by colons (i.e., 10:35:18).
- G. The audio/video recording shall consist of one video and one audio track which shall be recorded simultaneously. All tracks shall consist of the original live recordings and thus shall not be copies of other audio or video recordings.
- H. The audio track shall contain the narrative commentary. Ample descriptive narrative shall be recorded simultaneously during all recordings. Narration shall include clearly audible comments that will deliver station number and/or street address, locations, direction of view and rotation.
- I. Typical video segments should not exceed 10 minutes in length.
- J. Rotations of 360-degrees shall be at all locations being photographed and necessary to see all site conditions.
- K. Panning rate, zoom-in rate and zoom-out rate shall be controlled sufficiently such that playback will provide clarity of the object viewed.

01322 - 5 of 8 Revised 06/26/20

L. All recording shall be done during times of good visibility. No recording shall be done during periods of precipitation unless authorized by the City.

# 3.03 PRE-CONSTRUCTION PHOTOGRAPHS

- A. Scope: The purpose for pre-construction photo documentation is to record existing conditions, damage and features on or adjacent to the project site. The principal reason for obtaining photographs is so that existing conditions located in the Project Site may be clearly shown and documented in the event of a dispute. Contractor is required to notify the City within 2 weeks if the Pre-Construction Video or Photographs differ from the bid documents.
- B. Schedule: Take photographs after underground assets and utilities have been marked, prior to placement of materials or equipment on the Site and prior to the start of construction activities in an area. Photographs shall be submitted to the City for review and approval. Construction shall not begin until the pre-construction photographs have been submitted and approved.
- C. Pre-construction photographs shall be taken at sufficient intervals to be able to carefully document the pre-construction conditions of the Site before commencement of the Work. Photos shall be 360 views.
- D. In addition, select photographs shall be taken as needed along the construction limits.
- E. Overlapping composition techniques shall be employed to ensure maximum photographic coverage.
- F. Pre-construction photographs shall be taken after underground utilities and assets have been marked.
- G. Pre-construction photographs shall be taken with a representative of the City present unless otherwise authorized by the City.
- H. All Pre-Construction Photographs shall have sufficient detail to reveal the condition (including defects and damage) of all existing features.
- I. Pre-Construction Photos shall have an overlapping 360 view of the project area inside and outside structures/buildings.
  - 1. Views of structures, both inside and adjacent to the ROW/easement in areas where the Contractor/Design-Builder will be working within five (5) feet of said structure.
  - 2. Other views as requested by the City.

# 3.04 CONSTRUCTION PROGRESS PHOTOGRAPHS

- A. Scope: The Contractor/Design-Builder shall provide construction progress photographs to depict the progress of the work. The Contractor/Design-Builder shall be responsible for photographs of the Site to show the existing and general progress of the Work. The City will advise as to which views are of interest.
- B. Schedule: Photographs shall be taken at the time of the Pre-construction Photographs, a minimum of once per month throughout the duration of the Project, and at the time of the Post Construction Photographs. Construction Progress Photographs are to be submitted each month with the Contractor/Design-Builder's Application for Payment.
- C. This set of photographs will be taken as close as possible to the same locations and views of the pre-construction photography.

# 3.05 CONSTRUCTION ACTIVITY PHOTOGRAPHS

- A. Scope: The Contractor/Design-Builder shall provide photographs taken to document Site conditions and specific construction activities throughout the duration of the Project.
- B. Schedule: Photographs shall be taken two times per month (every two weeks) for the duration of the Project.

01322 - 6 of 8 Revised 06/26/20

- C. Construction Activity Photographs are to be submitted each month with the Contractor/Design-Builder's Application for Payment.
- D. Photographs shall be taken to depict the work accomplished during the month. These photographs are to include, but are not limited to, the following:
  - 1. Work not yet obscured.
  - 2. All assets that will be obscured by future work shall be photographed after work on the asset is completed and prior to the asset being obscured.
  - 3. When mechanical, electrical, plumbing or building inspections are scheduled.
  - 4. The beginning of installation of major items of equipment.
  - 5. After installation of major items of equipment.
  - 6. Other significant construction activities.
  - 7. As directed by the City.

# 3.06 POST-CONSTRUCTION PHOTOGRAPHS

- A. Scope: The Contractor/Design-Builder shall provide Post-Construction Photographs of the project area that documents the final restoration and construction improvements. Post-Construction photographs shall show the general condition of the construction zone (recording finished landscape and other restoration, plus construction improvements), and other areas that may have been affected by construction activities.
- B. Schedule
  - 1. Photographs shall be taken after completion of the Substantial Completion punch list when the project is complete, the Site is restored to the satisfaction of the City, and before submission of the Application for Final Payment.
  - 2. Post-construction photographs shall be taken after all items have been address from the Substantial Completion inspection, after cleanup and site restoration, and before application for final payment.
- C. Post-Construction Photographs are to be submitted with the Contractor/Design-Builder's Application for Final Payment.
- D. The Contractor/Design-Builder shall coordinate the schedule of the post-construction photographs with the City's Project Manager and shall provide at least 5 days written notice to allow the City's Representative to be present when the photographs are taken.

# 3.07 POST-CONSTRUCTION VIDEO

- A. Scope: The Contractor/Design-Builder shall prepare a color video recording with audio of all the areas affected by construction. All Post-Construction video recordings shall have sufficient detail to reveal the final, restored condition of all existing assets and in the immediate adjacent areas, which might have been affected by the construction operations. In addition, videographer shall move beyond the construction zone as needed to ensure documentation of features and areas that may not be adequately recorded.
- B. Schedule: The post-construction video shall be taken in conjunction with the post-construction photographs.
- C. Post-construction videos are to be submitted with the Contractor/Design-Builder's Application for Final Payment.
- D. Unless otherwise authorized by the City, the post-construction video recording shall be done with a representative of the City present.
- E. The Contractor/Design-Builder shall document all post-construction site conditions/elements of the Site as listed for the post-construction Photographs.
- F. The video documentation shall provide a clear and continuous view of the project alignment showing all visible utilities and features within the limits of construction.

01322 - 7 of 8 Revised 06/26/20

- G. To preclude the possibility of tampering or editing in any manner, all video recordings shall, by electronic means, generate and display continuously and simultaneously on the screen digital information to include the date and time of recording. The time information shall consist of hours, minutes and seconds, separated by colons (i.e., 10:35:18).
- H. The audio video recording shall consist of one video and one audio track which shall be recorded simultaneously. All tracks shall consist of original live recordings and thus shall not be copies of other audio and video recordings.
- I. The audio track shall contain the narrative commentary. Ample descriptive narrative shall be recorded simultaneously during all recordings. Narration shall include clearly audible comments that will deliver station number and/or street address locations, direction of view and rotation.
- J. Typical video segments should not exceed 10 minutes in length.

# 3.08 RECORD PHOTGRAPHS

- A. Scope: Record photographs are a subset of post-construction and construction progress photos that give a view of an effected, modified, updated, or new asset in a project.
- B. The photos are to be post-construction photos wherever practical. Construction Progress Photos shall be utilized when an asset will be obstructed by later portions of the project.
- C. Record Photos shall be taken of the asset from every feasible angle.
- D. All Record Photos shall be tagged per City Record File Tagging Standards.

# 3.09 DELIVERABLES

- A. Delivery of the documentation record shall be made as soon as is practical after the images are recorded. Deliverables include original photographs in JPG format, photographs converted to pdf format, interactive map index and navigation system.
- B. Electronic Storage Devices: Submit the navigation system on a non-returnable USB compatible flash drive. Submittals shall conform to the following:
  - 1. Submit with the monthly invoice two sets of digital photographs and/or videos. Each set shall be contained on a separate electronic storage device.
  - 2. Each set shall be cumulative of all photographs and/or videos taken to date.
  - 3. Affidavit(s) of Authenticity shall be included in a digital format.
- C. Document Management System: Unless otherwise noted in Section 01015 Specific Project Requirements, all deliverables shall be provided in an electronic format using the specified document management system and in accordance with paragraph 1.05 of this Section.

# END OF SECTION
#### 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

(( (M) ))'					
	Proje	Project Number			
<b>W</b>	Proje	ct Title			
KANSAS CITY MISSOURI					
το·			Da	te	
10					
ATTN:					
We are sending you Shop Drawings Copy of Letter	<ul><li>❑ Attached</li><li>❑ Prints</li><li>❑ Change</li></ul>	Order	□ Under separate □ Drawings □	cover via ❑ Samples	the following items Specifications
Copies	Date	No.		Description	
These are transmitte For Approval For Your Use As Requested	d as checked	below: App App Rete	roved as Submitted roved as Noted urned for Corrections	□ Resubmit □ Submit □ Return	Copies for Approva Copies for Distributio Corrected Print
For Review and C Remarks:	comment				
By:					
Бу					
Distribution:	Owner Contractor Construction Design Profe Consultant	Manager ssional			

# SECTION 01335 – DOCUMENT MANAGEMENT

# PART 1 - GENERAL

#### 1.01 SUMMARY

- A. An internet-based coordination and document management systems (DMS), e-builder & B2G, will be used for the Project. This system will be used to manage project documentation among the City (and/or Designee), Contractor (or Design-Builder) and Engineer of Record. The Contractor or Design-Builder shall utilize the document management system for all project related correspondence and documentation.
- B. The DMS will be utilized to create, track and organize project documentation (City's Representative will provide the exceptions), 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 Sample(s) Submittals.
  - 6. Transmittals.
  - 7. Change Management:
    - (a) General Contractor Requests for Interpretation.
    - (b) Proposal Requests.
    - (c) Work Change Directives. (Storage only)
    - (d) Change Orders.
  - 8. Reporting:
    - (a) Certified Payroll Report. (B2G)
    - (b) Subcontractors and Major Material Suppliers List. (B2G)
    - (c) Daily Labor Force Reports. (B2G)
    - (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.
  - 9. Notifications:
    - (a) Correction of Defective Work.
    - (b) Notification of Non-Compliant Work.

## 1.02 RELATED SECTIONS

- A. Section 00700 General Conditions.
- B. Section 01015 Specific Project Requirements.
- C. Section 01300 Submittals.

# 1.03 COORDINATION MEETING

A. Prior to the pre-construction conference, the City will facilitate a meeting with the Contractor or Design-Builder to review requirements for project coordination, document control and use of the DMS. The meeting should be scheduled to allow

01335 - 1 of 2 Revised 05-08-20

Kansas City, Missouri Water Services Department Standard Specification the Contractor or Design-Builder time to submit the initial project correspondence, other requirements 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.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

#### END OF SECTION

# **SECTION 01340 - PROJECT BIM COORDINATION**

PART 1 - GENERAL

- 1.01 SUMMARY OF WORK
  - A. This section covers Building Information Modeling (BIM) enabled projects.

# 1.02 Related Sections

- A. 01000 General Requirements
- B. 01019 Closeout Procedures
- C. 01615 Equipment Identification & Tagging
- D. 01340.A Attributes
- E. Kansas City Water Services Department Design Standards CAD Drawing Standards
- 1.03 CODES AND SECTIONS
  - A. Not Applicable
- 1.04 DEFINITIONS
  - A. General Definitions
    - 1. BIM Building Information Model
    - 2. Design Phase The overall design is broken into separate stages. Each phase is a certain level of development.
    - 3. LIDAR This is an acronym for Light Detection and Ranging. This method measures distances using laser light and measuring the reflection with a sensor. This is also called 3-D Laser Scanning.
    - 4. Modeled Object An equipment asset created in BIM. Modeled objects are tagged using a parent-child-grandchild data structure with CMMS tag level 6 is the parent, CMMS tag level 7 is the child, CMMS tag level 8 is the grandchild. The grandchild inherits data from the child and the child inherits data from the parent.
    - 5. Overlay Placing an object over the surface of another of another object thus allowing the object to be visible on drawings or other deliverables by viewer.
    - 6. Point Cloud A set of data points in space used for capturing existing conditions of any site.
    - 7. Relative File Path a defined location relative to BIM's current directory
    - 8. Site Types
      - a. Brownfield Project locations with hazardous materials at in existing in-use facilities by City.
      - b. Grayfield Project locations with existing in-use facilities by City.
      - c. Greenfield Project locations with no in-use facilities by City.
    - 9. Standard Component Any valve, pipe, duct, fitting, cable, cable tray, conduit, wiring, or structural member where aforementioned component is dimensionally defined in a Design Standard.
    - 10. State Plane Coordinate System U.S. Coordinate system used by each U.S. state and has between one to six zones depending on size and shape.

# B. Software Definitions

- 1. Software Packages
  - a. BIM 360 Autodesk BIM software that shows the latest published Revit 3D models for design collaboration between Owner and Contractors.
  - b. CMMS Computerized Maintenance Management System used for operation and maintenance of facility assets. CITY's current CMMS is Hansen Infor<sup>TM</sup>.
  - c. Revit Autodesk software used for Building design, Foundation design, Structural design, and MEP design.
- 2. CMMS
  - a. CMMS Parameters Fields within Autodesk Revit associated with identifying and describing an asset or equipment item. These fields allow for the creation of unique identifiers for each piece of equipment, and allowing for synching with CITY's CMMS. Refer to Section 013124.A BIM Attributes.
  - b. CMMS Synching Process that integrates the BIM model with CMMS.
- 3. CMMS Facility Key Unique identifier used in City's asset management system. The asset management system relies on this unique identifier to incorporate all information collected into the asset management system. This may hereinafter also be referred to as the Comp Key.
- 4. Dynamic Any item, field, attribute, or other component which receives an active input from a source other than by a manual user.
- 5. Parameter Fields with populated values in BIM modeling software. In Autodesk Revit, these are commonly referred to as family parameters.
- Publish The process of pushing any model changes into cloud-based BIM software for the purpose of coordination between interdisciplinary and inter-organizational teams
- 7. Static Any item, field, attribute, or other component which requires manual edit to change its value.

# 1.05 BIM INFORMATION PROVIDED BY OWNER

# A. Existing

- 1. Existing survey information, GIS data, 2D drawing documents, and existing BIM models will be shared with BIM responsible person(s).
- 2. Non-available information will be determined prior to commencing any site visits. If needed, non-available information will be collected while on site and incorporated into the BIM model. Site visits may also identify any additional information needed for completion of Work and needed to be included in the BIM model.
- 3. CITY may provide a template from Revit, or BIM 360 before commencement of Work by Design Professional.
- 4. CITY encourages the use of LIDAR for documenting conditions due to increased efficiency over other methods.
- 5. CITY will provide CMMS Facility Key information for existing assets in CMMS.

# 1.06 BIM INFORMATION PROVIDED BY DP

# A. General

- 1. All BIM-related design shall be performed in Autodesk Revit.
  - a. Prior to commencing Work, DP shall confirm which software version to perform Work in.
  - b. Scope of BIM Work that may be performed using Autodesk Revit and loaded to a cloud-based location.
- 2. DP shall keep a published file for each BIM model revision used for design reviews for the purpose of traceability.
- 3. All standard pipe, fittings and other components shall be easily identifiable and in addition to geometric dimensions, each standard component shall be specified enough such that it may be furnished and installed from provided design documentation. These components may be pulled from existing catalogs; however, they shall adhere to all data requirements.
  - a. Pipe and fittings
  - b. Conduit, Cable Tray
  - c. Ductwork
  - d. Major Structural, and Architectural Elements
  - e. Electrical Housing
  - f. Instrumentation & Controls Housing
- 4. DP shall not add any level 7 equipment tags without CITY approval. Equipment may be given a Level 8 tag. Level 8 changes will be done in coordination with CITY. Level 8 must be coordinated to maintain consistency throughout utilities.
- 5. Tolerances
  - a. Equipment locations shall be within a 1" tolerance. If equipment is installed on foundations with cast-in-place, tolerances shall be tightened such that the equipment aligns with foundations.
  - b. All equipment component dimensions in BIM model shall have tolerances no greater than 1/4" and representative of the dimensions for all buildings, tanks, equipment, piping, valves, and appurtenances used during project construction.
  - c. BIM tolerances will be within the GIS snapping tolerances required for a utility trace. DP shall tighten the tolerance of only the equipment items needed for a GIS utility trace.
- B. Existing Facility Assets
  - 1. If the project has a tie-point to an existing asset, it is the DP's responsibility to include all component information needed to complete the tie-in into the BIM model.
  - 2. Existing underground utilities shall use 2D representation.
  - 3. For parameters of exiting assets with missing information and requires an input by software, DP may use the text "N/A".
- C. Equipment and Component Specifications
  - 1. All final submittals from Suppliers shall be provided to DP for integration into the BIM model.

- 2. For equipment packages, actuated valves, instruments, and piping specialty items, a hyperlink shall be used to connect aforementioned items in the BIM model to the project network location for all equipment with a Level 8 code.
- D. BIM Parameters
  - 1. DP shall assign equipment tags per Section 01615 Equipment Identification and Tagging.
  - 2. There shall be a BIM parameter for each field found in CITY's CMMS.
  - 3. Equipment O&M Hyperlinks
    - a. All equipment must have parameters added and grouped in accordance with the CITY attribute standards.
    - b. In Revit, all CMMS parameters will be located within the "Identity Data" parameter group.
    - c. In Revit, All facility asset parameters will be located within the "Data" parameter group.
  - 4. Parameters that are not applicable for components shall be filled in with the text "N/A"

# 1.07 COORDINATION

- A. The coordinate system used for all BIM projects shall be the Missouri Coordinate System of 1983, West Zone and NAVD 88 Datum.
- B. CITY and DP will coordinate project phases and the corresponding LOD for each phase before starting any pre-design work or design work using BIM.
- C. CITY preference is to have read-only access to current working models and to be able to download a copy of recently published versions of models.
- D. It is CITY's responsibility to integrate BIM with City CMMS. Procedure following is provided as a courtesy.
  - 1. Tagging of all new equipment shall be per Section 01615 Equipment Identification and Tagging.
  - 2. Newly assigned tags are provided to CITY for creation of new assets in CMMS.
  - 3. CITY issues Facility Key for input into BIM model.
  - 4. DP will add CMMS Facility Key input as BIM parameter.
  - 5. BIM will use Facility Key and network location for integration into CMMS.
- E. If the project involves the installation of new assets, then DP shall coordinate with CITY to have new CMMS Facility Keys assigned to the new assets. CMMS Facility Keys will be assigned by CITY after equipment tags have been assigned.

# 1.08 RECORD BIM DATA

- A. General: Transmit published BIM and all related files for CITY's reference during normal working hours. Any construction-related needs will be deferred to construction drawings for interpretation by DP.
- B. At the end of the project, Record BIM Data shall be incorporated to include but not limited to: 3D representation of Work, all data parameters completed and all linked information in relative file paths.
- C. Data Parameters

1. BIM and its data shall be conformed to construction records prior to BIM turnover.

01340 - 4 of 6 Revised 05-05-21 Kansas City, Missouri Water Services Department Standard Specification

- For BIM facility asset parameters, fill out all data parameters as defined in 013124.A

   Attribute Standard including relative hyperlinks per the file structure for all
   information the DPs/Contractors have.
- 3. Any hyperlink will direct the user to the designated file location.
- 4. Transmittals required by DP must be included in the CITY's Record Submittal Zip File. All files stored in Windows 10 shall have tag metadata that includes CMMS Level 1 through CMMS Level 8 asset information.
- 5. The folder containing the designated file locations will appear as shown in Figure 01.



Figure 01: Record Submittal Zip File Structure

- D. Submission
  - 1. BIM model must be cross-checked against field records and is free of conflicting data.

01340 - 5 of 6 Revised 05-05-21 Kansas City, Missouri Water Services Department Standard Specification

- 2. Each BIM parameter with a link to a file shall be confirmed to work using relative file paths. Relative file paths will be used when during turnover of the Revit model and equipment documentation. Refer to CITY's Attribute Standard and CITY zip submittal.
- 3. Naming of BIM files must be coordinated with CITY's representative prior to submission at Closeout. At CITY's discretion, the file names will change at request by CITY.
- 4. Give particular attention to information on equipment components that cannot be readily identified in the field and recorded later.
- E. For requirements regarding closeout procedures, refer to Section 01019.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION Not used.

# END OF SECTION

# **Equipment Parameters**

		CMMS Parameters	
ID Attribute	Attribute Description	Example Data	Comment
01 - CMMSDept	CMMS Department (Lvl. 1)	WSD	Text
02 - CMMSDiv	CMMS Division (Lvl. 2)	Wastewater	Text
03 - CMMSSec	CMMS Section (Lvl. 3)	Treatment	Text
04 - CMMSFacilityKey	CMMS Facility Key	(Assigned by KCWater)	Text
05 - CMMSAddressNumber	CMMS Address Number		Number
06 - CMMSAddressPreDir	CMMSAddressPreDir		Text
07 - CMMSAddressStreet	CMMS Address Street		Text
08 - CMMSAddressSuffix	CMMS Address Suffix		Text
09 - CMMSAddressPostDir	CMMS Address PostDir		Text
10 - CMMSAddressSubdesignation	CMMS Address Subdesignation		Text
11 - CMMSAddressCity	CMMS Address City		Text
12 - CMMSAddressState	CMMS Address State		Text
13 - CMMSAddressZIP	CMMS Address ZIP		Number
14 - CMMSSubArea	CMMS Sub-Area (Lvl. 4)	PXXX	Text
15 - CMMSProc	CMMS Process/Function (Lvl. 5)		Text
16 - CMMSSubProc	CMMS Systems (Lvl. 6)		Text
17 - CMMSEquip	CMMS Equipment (Lvl. 7)		Text
18 - CMMSComp	CMMS Component (Lvl. 8)		Text
19 - CMMSNumb	CMMS Number		Number
20 - CMMSDescription	CMMS Description		Text

Facility Asset Parameters				
Design Attribute	Attribute Description	Example Data		Comment
01 - ProjectNumber	Project Number		XXXXXXXXX	Text
02 - BidPkgNumber	Bid Package Number		P-XXXXX	Text
03 - ProvidedBy	Provided By		Contractor	Text
04 - InstalledBy	Installed By		Contractor	Text
05 - LocalRep	Local Representative		Contractor	Text
06 - Manufacturer	Manufacturer		XXXXX	Text
07 - Model	Model		XXXXX	Text
08 - SN	Serial Number		XXXXX	Text
09 - InstallationDate	Installation Date		XXXX.XX.XX	Text
10 - CommissionDate	Commission Date		XXXX.XX.XX	Text
11 - DecommissionDate	Decommission Date		XXXX.XX.XX	Text
12 - WarrantyStartDate	Warranty Start Date		XXXX.XX.XX	Text
13 - WarrantyEndDate	Warranty End Date		XXXX.XX.XX	Text
14 - BidPkg	Bid Package		\3 - Equipment\(Lv16).(Lv17).(Lv18).No\1 - Bid Pkg	URL

15 - DS	Equipment Datasheet	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\2 - DS URL
16 - Submittals	Submittals	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\3 - Submittals URL
17 - O_MProcess	Operation & Maintenance Process	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\5 - Submittals\1 - O_M Process URL
<del>18 OEMs</del>	Original Equipment Manufatureres	\3 Equipment\(Lv16).(Lv17).(Lv18).No\5 Submittals\2 OEMS URL
19 - O_Mmanual	Operation & Maintenance Manual	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\5 - Submittals\3 - O_M Manual URL
20 - SOPs	Standard Operating Procedures	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\5 - Submittals\4 - SOPs URL
21 - Training	Training	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\5 - Submittals\5 - Training URL
22 - Other	Other	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\5 - Submittals\7 -Others URL
23 - PredictiveMaintTesting	Predicitive Maintenance Testing	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\5 - Submittals\6 - Predictive Maintenance Testing URL
24 - PhotosAndVideos	Photos and Videos	\3 - Equipment\(Lvl6).(Lvl7).(Lvl8).No\5 - Submittals\7 - Photos and Videos URL
25 - PredictiveMaintLog	Predicitive Maintenance Log	https://www.xxxx.com URL - (Hyperlink to CMMS log)
26 - PreventativeMaintenanceLog	Preventative Maintenance Log	https://www.xxxx.com URL - (Hyperlink to CMMS log)
27 - CorrectiveMaintenanceLog	Corrective Maintenance Log	https://www.xxxx.com URL - (Hyperlink to CMMS log)
28 - GEN	General Notes	/2 - Drawings/1 - General Notes/Filename.pdf URL - (To Location of General notes sheet applicable to Equip.)
29 - PID	PID Drawing	\2 - Drawings\2 - PIDs\Filename.pdf URL - (To Location of P&ID where Equip. can be found on it)
30 - PL	Plan Drawing	/2 - Drawings/3 - Plans/Filename.pdf URL - (To Location of Plan Dwg where Equip. can be found on it)
31 - ELP	Enlarged Plan Drawing	\2 - Drawings\4 - Enlarged Plans\Filename.pdf URL - (To Location of Plan Dwg where Equip. can be found on it)
32 - EL	Elevation Drawing	/2 - Drawings/5 - Elevations/Filename.pdf URL - (To Location of Elevation Dwg where Equip. can be found on it)
33 - PRO	Profile Drawing	2 - Drawings\6 - Profiles\Filename.pdf URL - (To Location of Profile Dwg where Equip. can be found on it)
34 - SEC	Section Drawing	2 - Drawings\7 - Sections\Filename.pdf URL - (To Location of Section Dwg where Equip. can be found on it)
35 - DET	Detail Drawing	2 - Drawings\8 - Details\Filename.pdf URL - (To Location of Detail Dwg where Equip. can be found on it)

- 1. Equipment O&M Parameters
  - a. In Autodesk Revit, the following parameters shall be ac
    - 1. Manufacturer
    - 2. Model
    - 3. Contract Number PO Number
    - 4. Procurement Submittals
    - 5. Serial Number
    - 6. Date Installed
    - 7. Warranty Start Date
    - 8. Warranty End Date
    - 9. Installation and Operation Manual
    - 10. Standard Operating Procedures
    - 11. Inspection Log
    - 12. Maintenance Schedule
    - 13. Equipment Drawings

Add list to excel file. And also reference attribute standard.

dded and grouped underneath "Data" within Parameter Properties.

# 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.
- I. Section 01580 Project Signs.
- J. Section 02300 Earthwork.

#### 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.

01352 – 1 of 8 Revised 06/03/21

#### 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.

01352 – 2 of 8 Revised 06/03/21

- 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.

01352 – 3 of 8 Revised 06/03/21

- 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.

01352 – 4 of 8 Revised 06/03/21

- 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

01352 – 5 of 8 Revised 06/03/21

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.

01352 – 6 of 8 Revised 06/03/21

- (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. Remove trees and shrubs within marked areas; clear undergrowth and dead plant material as specified in Section 02300 Earthwork.
- G. Backfill open pits and holes caused by demolition as specified in Section 02300 Earthwork.
- H. Rough grade areas affected by demolition.
- I. 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.

01352 – 7 of 8 Revised 06/03/21

- 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
  - 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.
- I. Section 01580 Project Signs.

#### 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 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.

01354 – 3 of 6 Revised 06/03/21

- 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.

01354 – 5 of 6 Revised 06/03/21

- 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 01400 - QUALITY CONTROL

# PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Quality assurance control of installation.
- B. Reference and standards.

# 1.2 RELATED SECTIONS

A. Section 01300 - Submittals: Submission of manufactures' instructions and certificates.

# 1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.

# 1.4 REFERENCES AND STANDARDS

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for receiving bids, except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract nor those of the Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

# PART 2 - PRODUCTS

Not Used.

# PART 3 - EXECUTION

# 3.1 EXAMINATION

A. Verify that existing site conditions are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Examine and verify specific conditions described in the applicable individual specification sections.

# 3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

End of Section.

# **SECTION 01410 - REGULATORY REQUIREMENTS**

# PART 1 GENERAL

## 1.01 SUMMARY

A. Section includes: Regulatory authorities and codes. Any costs associated with code compliance with the Kansas City, Missouri Codes Department are the responsibility of the CONTRACTOR.

# 1.02 AUTHORITIES HAVING JURISDICTION

A. Building Department: City of Kansas City, Missouri.

# 1.03 APPLICABLE CODES

- A. International Code Council (ICC).
  - 1. Building code:
    - a. International Building Code (IBC), 2012.
      - 1) With City of Kansas City, Missouri amendments.
    - b. International Existing Building Code (IEBC), 2012.
  - 2. With City of Kansas City, Missouri amendments Electrical code:
    - a. National Fire Protection Association (NFPA), NFPA 70: National Electrical Code (NEC), 2011.
      - 1) With City of Kansas City, Missouri amendments.
  - **3**. Energy code:
    - a. International Energy Conservation Code (IECC), 2012.
      - 1) With City of Kansas City, Missouri amendments.
  - 4. Fire code:
    - a. International Fire Code (IFC), 2012.
      - 1) With City of Kansas City, Missouri amendments.
  - 5. Fuel gas code:
    - a. International Fuel Gas Code (IFGC) 2012.
      - 1) With City of Kansas City, Missouri amendments.
  - 6. Mechanical code:
    - International Mechanical Code (IMC), 2012.
      - 1) With City of Kansas City, Missouri amendments.
  - 7. Plumbing code:

a.

- a. Uniform Plumbing Code (UPC2012).
  - 1) With City of Kansas City, Missouri amendments.

# PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

# SECTION 01433 - MANUFACTUERS' FIELD SERVICES

## PART 1 – GENERAL

#### 1.01 SUMMARY

- A. This Section includes procedural requirements including field services for testing, startup, and training for the City of Kansas City Missouri.
- B. The Contractor or Design-Builder shall furnish all labor, materials, equipment, and incidentals as necessary to comply with these requirements.

#### **1.02 RELATED DOCUMENTS**

- A. 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.
- B. Related Sections include the following:
  - 1. Divisions 2 through 16 Sections for specific requirements for any field services and startup instructions of applicable products in those Sections.
  - 2. Section 01300 Submittals.
  - 3. Section 01664 Training.
  - 4. Section 01757 Commissioning.

#### **1.03 DEFINITIONS**

- A. Work-day: One person's labor for 8 hours of work within the City and the Contractor or Design-Builder's working hours.
- B. Systems Integrator: A contractor specializing in bringing together automation hardware and software subsystems into one system.

#### 1.04 SUBMITTALS

#### A. Informational submittals:

- 1. Training Schedule: Submit in accordance with requirements of this Specification not less than 30 days prior to start of equipment installation and revise as necessary for acceptance.
- Lesson plan: Submit, in accordance with requirements of this Specification, proposed lesson plan not less than 30 days prior to scheduled training and revise as necessary for acceptance. Lesson will also be submitted and approve for training credit by the Missouri Department of Natural Resources Operator Certification Program.

#### 1.05 QUALIFICATIONS OF MANUFACTUERER'S REPRESENTATIVE

- A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystems, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified in the individual specification section.
- B. Representative subject to acceptance by the City's Representative. No substitute representatives will be allowed unless prior written approval by such has been given.

# PART 2 - PRODUCTS (Not Used)

## PART 3 – EXECUTION

#### 3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

- A. Furnish manufacturers' services, when required by individual specification section, to meet requirements of this section.
- B. Comply with the requirements in Division 1 Section 01757–Commissioning.
- C. Where time is necessary in excess of that stated in the Specifications for manufacturers' services, or when a minimum time is not specified, time required to perform specified services shall be considered incidental.
- D. Contractor or Design-Builder shall schedule manufacturers' services to avoid conflict with other onsite testing in this project and other training of division personnel or manufacturers' onsite services.
- E. Before scheduling services, determine the conditions necessary to allow successful testing have been met.
- F. Only those days of service approved by the City's Representative will be credited to fulfill specified minimum services.
- G. Contractor or Design-Builder shall coordinate manufacturer's field services with the systems integrator, so both are on-site during field services if desired by the City.
- H. When specified in individual specification sections, manufacturer's onsite services shall include:
  - 1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor or Design-Builder's assembly, erection, installation or application procedures.
  - 2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish manufacturer's certificate of Proper Installation.
  - 3. Providing, on a daily basis, copies of manufacturers' representatives field notes and data to Owner.
  - 4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to the Engineer of Record or City's Representative.
  - 5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer's products and system.
  - 6. Assistance during functional and performance testing, commissioning, and system startup and evaluation.
  - 7. Training of Owner's personnel in the operation and maintenance of respective product as required.

#### 3.02 MANUFACTURER'S CERTIFICATE OF COMPLIANCE

- A. When so specified, a Manufacturer's Certificate of Compliance form, a copy of which is attached to this section, shall be completed in full, signed by an entity supplying the product, material, or service, and submitted prior to shipment of product or material or execution of the services.
- B. City's Representative may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.
- C. Such form shall certify proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.

01433 – 2 of 6 Revised 06/03/21

- D. May reflect recent or previous test results on material or product, if acceptable to the City's Representative.
- 3.03 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION
- A. When so specified, a copy of the Manufacturer's Certificate of Proper Installation form shall be completed and signed by equipment manufacturer's representative.
- B. This form shall certify signing party is a duly authorized representative of the manufacturer, is empowered by the manufacturer to inspect, approve, and operate their equipment, and is authorized to make recommendations required to ensure equipment is complete and operational.

# 3.04 TRAINING

A. Refer to Section 01664– Training for training requirements.

# 3.05 SUPPLEMENTS

- A. Supplements listed below, following "End of Section", are part of this Specification.
  - 1. Manufacturer's Certificate of Compliance Form.
  - 2. Manufacturer's Certificate of Proper Installation Form.

END OF SECTION
# MANUFACTURER'S CERTIFICATE OF COMPLIANCE FORM

OWNER:	PROJECT, MATERIAL OR SERVICE SUBMITTED:
PROJECT NAME:	PROJECT NO.
COMMENTS:	

I hereby certify that the above referenced product, material, or service called for by the Contract for the named Project will be furnished in accordance with the applicable requirements. I further certify that the product, material, or service are of the quality specified and conform in all respects with the Contract requirements and are in the quantity shown.

Date of Execution	,20
Manufacturer:	
Manufacturer's Authorized Representative (print)	
Manufacturer's Authorized Representative (Signature)	

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION FORM

OWNER	EQPT SERIAL NO.
EQPT TAG NO.	EQPT/SYSTEM
PROJECT NO.	SPEC. SECTION

I hereby certify that the above referenced equipment/system has been:

(Check Applicable)

Installed in accordance with Manufacturer's recommendations.

Inspected, checked, and adjusted.

Serviced with proper initial lubricants.

Electrical and mechanical connections meet quality and safety standards.

All applicable safety equipment has been properly installed.

Functional tests.

System has been performance tested, and meets or exceeds specified performance requirements.

(When complete system of one manufacturer)

COMMENTS:

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment, and (iii) authorized to make recommendations required to ensure equipment furnished by

01433 – 5 of 6 Revised 06/03/21

the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date of Execution	,20	
Manufacturer:		
Manufacturer's Authorized Representative (print)		
Manufacturer's Authorized Representative (Signature)		

## SECTION 01480 - WATER TIGHTNESS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. This Section includes hydrostatic leakage testing for concrete water-containing structures.

#### 1.02 REFERENCES

### A. Definitions.

- 1. Damp spots: Surfaces where visible moisture can be picked up by a dry hand.
- 2. Containment structure, lined: Liquid-containing structure with barrier coating or membrane applied to the inside surfaces to prevent leaking of contents to the outside.
- 3. Containment structure, unlined: Liquid containing structure where only the concrete structure itself is used to prevent leaking of contents to the outside.

### B. Reference standards.

- 1. Section 03300 Cast-in-Place Concrete
- 2. Section 02300 Earthwork

### **1.03 DEFINITIONS**

- A. Definitions.
  - 1. Damp spots: Surfaces where visible moisture can be picked up by a dry hand.
  - 2. Containment structure lined: Liquid-containing structure with barrier coating or membrane applied to the inside surfaces to prevent leaking of contents to the outside.
  - 3. Containment structure, unlined: Liquid containing structure where only the concrete structure itself is used to prevent leaking of contents to the outside.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination.
- B. Pre-installation meetings.
- C. Sequencing.
- D. Scheduling.

### 1.05 SUBMITTALS

- A. Shop drawings:
  - 1. Description and details of each evaporation/precipitation-measuring device anticipated for use during the test.
- B. Tests and evaluation reports:
  - 1. Results of water leakage test for each structure and for each portion of a structure designated for testing.
- C. Special procedure submittals:
  - 1. Testing plan for each structure, or portion thereof, required to be tested.
    - a. Describe methods of obtaining water for testing and of releasing water for disposal, including provisions for dechlorination if required.
    - b. Include plans showing locations where measurements will be made and locations of evaporation/precipitation-measuring device.

01480 – 1 of 10 Revised 06/03/21

- c. Indicate plans for filling and draining structure(s).
- d. Include schedule showing duration of test for each structure or cell to be tested, date and time for start of each test, dates and times of observations and measurements during the test, dates and times for closeout of testing procedures, and date for submittal of final results.
- 2. Proposed procedures and products for repair of leaks.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 – EXECUTION

## 3.01 GENERAL

- A. Test structures and portions of structures listed in the following paragraphs for water leakage.
  - 1. Unless otherwise specified, the Contractor shall:
    - a. Obtain all required permits for discharging testing water.
    - b. Provide dechlorination of such water if required by the permits.
    - c. Prepare and fill the structures.
    - d. Provide access and equipment required for testing and for recording test results.
    - e. Take measurements and make observations required for testing.
  - 2. At all times during testing, the Engineer shall have access to observe measurements by others or to make independent measurements.
- B. Test the following concrete structures for water leakage:
  - 1. West Grit Basin Modifications Chamber at SG-207 and SG-208.
  - 2. Influent and Screening Channels.
  - 3. Bypass Channel.
  - 4. Grit Basin.
  - 5. Grit Basin Effluent Channel.
  - 6. Headworks Effluent Box 1.
  - 7. Headworks Effluent Box 2.
- C. Required preparation for testing is designated in this Section. Waiver of, or failure to complete preparations shall not change the testing criteria or approval criteria for the areas tested.
- D. Retest structures and portions of structures until the evaluation criteria are satisfied.

## 3.02 TEST WATER SOURCE AND DISPOSAL

- A. Water used for the first filling of the tank will be furnished by Owner.
  - 1. Contractor shall obtain water for leakage testing from:
    - a. Disinfected effluent between April 1 and October 31.
    - b. Secondary effluent between November 1 and March 31.
- B. In the event that retesting is required, Contractor shall bear the cost of refilling the tank for subsequent tests.
- C. After leakage testing is complete, Contractor shall dispose of water by discharging to Primary Treatment.

## 3.03 PREPARATION

- A. For each structure to be tested, prepare and submit a plan showing schedule and sequence of activities, method of filling, and methods of disposing of test water.
- B. Sequencing requirements:
  - 1. Complete construction of concrete structure and cure concrete to obtain minimum specified 28-day compressive strength as specified in Section 03300 Cast-in-Place Concrete.
    - a. Do not begin tests until all portions of structure are complete and have reached their minimum specified 28-day compressive strength.
    - b. Do not begin tests until at least 14 days have passed since completion of the last concrete placement.
  - 2. Complete tests before:
    - a. Covering any surface of the structure with materials that might mask the location of leaks or obscure damp concrete surfaces. Such coverings include, but are not limited to basin bottom grout, masonry veneer, stucco, plaster, and other coatings.
    - b. Installation of equipment, unless otherwise approved by the Engineer.
    - c. Backfilling structures to elevations above the limits indicated in the following paragraphs.
  - 3. Liners and coatings:
    - a. Field-coated or installed liners and coatings shall be applied in strict conformance to manufacturer's standards.
    - b. Install liners that are mechanically locked to the concrete surface during placement of plastic concrete and before leakage testing.
      - (1) Examine liners for pinholes, tears, and partially fused splices, complete all required liner integrity testing, and make required repairs before commencing leakage testing.
    - c. Unless otherwise specified, do not install surface-applied protective or decorative coatings and linings until leakage tests have been completed.

## C. Weather requirements:

- 1. Tests on structures with tops open to the atmosphere shall not be scheduled for periods when the 10-day weather forecast indicates a substantial change in weather patterns.
- 2. Measurements of water surface levels in the structure shall not be scheduled for periods when the weather forecast indicates a difference of more than 35 degrees Fahrenheit between the ambient temperature readings at the times of initial and final measurements.
- 3. Tests shall not be scheduled for periods when the 10-day weather forecast indicates that the water surface may freeze before the test is complete.
- D. Groundwater requirements:
  - 1. Bring groundwater to a level not higher than 3 feet below the bottom of the structure and maintain at that level for the duration of the test.
- E. Clean interior of structure:
  - 1. Remove dirt, contaminants, and construction debris.
  - 2. Flush floors and sumps to provide clean surfaces.
  - 3. Remove standing water that would interfere with examination of surfaces, cracks, or joints.

- F. Observe the structure, or portions of the structure being tested, for potential leak locations.
  - 1. Give particular attention to cracks, open joints, voids, and honeycombed and repaired surfaces.
  - 2. Visually observe openings, fitting, and pipe penetrations in the structure at both faces, if possible.
  - 3. Repair potential leak locations in accordance with these Specifications and as approved by the Engineer.
  - 4. Backfill excavations to the top of the structure foundation. Do not place backfill against water-bearing walls or over footings unless approved in advance by the Engineer.
    - a. If requesting backfilling of walls before testing, include a description of methods that will be used to detect leakage in the backfilled areas.
    - b. Engineer's approval of backfilling before testing shall not relieve Contractor of the responsibility to conduct leakage tests, to satisfy the leakage acceptance criteria for the structure, or to repair leaking portions of the structure, including those portions below or behind the backfill.
  - 5. See Drawings and Section 02300 Earthwork for requirements to provide wall stability before backfilling.
- G. Inlets to/outlets from the structure:
  - 1. Inlets to and outlets from the structure shall be watertight.
    - a. Include valves, sluice, and/or slide gate valves and temporary bulkheads as required.
    - b. Inlets and outlets not required to be operable may be temporarily sealed before testing the compartments to which they open.
    - c. Secure inlets used to fill the structure for testing to ensure that no water is entering or leaving the structure once it has been filled to the test level.
  - 2. Adjustments to measured leakage at inlets and outlets based on manufacturers or Contractor's estimates will not be allowed.
    - a. Adjustments to measured leakage may be permitted by the Engineer, and, at their discretion, only when the Contractor makes specific measurements of leakage at each individual inlet and outlet using methods approved by the Engineer.

# 3.04 HYDROSTATIC LEAKAGE TEST FOR OPEN OR COVERED CONTAINMENT STRUCTURES

- A. Isolate sections of water-holding structures that can be isolated in actual operation. Fill and test sections for leakage separately.
  - 1. Fill structures and sections of structures scheduled for testing to the normal operating water level indicated on the Hydraulic Profile indicated on the Drawings.
- B. Initial rate for filling of structures shall not exceed 8 feet in 24 hours.
- C. HST-100 testing includes 2 parts, "Qualitative Testing," and "Quantitative Testing," as described in the following paragraphs:
  - 1. HST-100, Part 1 Qualitative Testing:
    - a. During the first 24 hours after structures are filled, examine exposed concrete surfaces for damp spots or flowing water.
      - (1) Make observations in early morning, at midday, and in late afternoon.
      - (2) Continue observations through the duration of the Quantitative Testing period.

01480 – 4 of 10 Revised 06/03/21

- (3) Pay particular attention to conditions at joints, honeycombed areas, cracks, and repaired portions of the structure.
- b. Evaluation criteria:
  - (1) The structure shall be considered to have failed these Qualitative Testing requirements if any of the following conditions are observed.
    - (a) Water droplets or moist areas on an outside surface that could only have originated inside the structure.
    - (b) Water is flowing or seeping from joints, cracks, or surfaces.
      - (i) Exception: Dampness or wetness on top of a footing, in the absence of flowing water, shall not be considered as failure to meet this criterion.
    - (c) Moisture can be transferred to a dry hand from the outside surfaces of the filled area.
- c. Repairs and retesting:
  - (1) Where damp spots or flowing water as described in the preceding paragraphs are observed, mark locations, provide repairs, and retest the structure as specified in subsequent paragraphs.
- 2. HST-100 Part 2: Quantitative Testing:
  - a. If approved by the Engineer, Quantitative Testing may begin before repairs are made to areas failing Part 1 of this test; however:
    - (1) Adjustments to volume loss calculations of Quantitative Testing based on observed leakage will not be permitted.
    - (2) All defects identified for repair during Qualitative Testing shall be repaired to the satisfaction of the Engineer before approval of the structure.
  - b. Report the results of Quantitative Testing on "Leakage Test Report" included as Figure A at the end of this Section, or similar form prepared by the Contractor and containing at least the information included in Figure A.
  - c. Unlined concrete structures:
    - (1) Fill to the designated water surface elevation. Maintain that level for at least 72 hours before recording initial water levels for leakage test.
    - (2) Duration of test:
      - (a) Theoretical time required to lower the water surface in the structure by 3/8 inch when leakage is occurring at the maximum allowable rate specified in subsequent paragraphs of this Section.
      - (b) The duration ("D") of the test in days is determined by the following equation:

 $D = \frac{.375 \text{ inches}}{0.005 \text{ in/in/day} \times H \text{ ft} \times 12 \text{ in/ft}}$ Where H = Maximum Liquid Depth

- (i) Round results upward to the next full 24-hour period (day).
- (ii) Minimum duration of test: 24 hours (1 day).
- (iii) Maximum duration of test: 120 hours (5 days).
- d. Lined concrete structures and secondary containment areas:
  - (1) Fill to the designated water surface elevation. Recording of water levels for leakage tests may begin as soon as the designated water surface level is

01480 – 5 of 10 Revised 06/03/21

reached and the water surface is calm. 2) Duration of test: 72 hours (3 days).

- e. Measurements: Water level:
  - (1) Record water levels at 24-hour intervals for the full duration of the test period.
  - (2) Measure water levels at not less than 2 locations on opposite ends of the structure, and preferably at 4 locations spaced equally around the structure. Mark locations on the structure and take measurements at the same locations throughout the duration of the test.
  - (3) Measure, to an accuracy of 1/16 inch, the vertical distance to the water surface from a fixed point on the structure above.
- f. Measurements: Temperatures:
  - As part of the first and last sets of level measurements, record water temperature at a depth of 18 inches below the water surface. Measure temperature at the same locations where level measurements are taken.
  - (2) Record ambient temperature at the time of each water level measurement.
- g. Measurements: Evaporation and precipitation:
  - (1) Measure evaporation and precipitation by floating pans inside the structures during testing.
    - (a) For uncovered structures, measure both evaporation and precipitation.
    - (b) For covered structures that are well ventilated, measure evaporation.
  - (2) Measure using specially constructed clear containers:
    - (a) Provide clear plastic, calibrated, open-top containers not less than 18 inches in diameter and 18-inches deep.
    - (b) Partially fill containers with water and float inside the structure. Make provisions to hold containers in place at each measurement location, but away from structure walls and items passing overhead, such as beams or pipes.
    - (c) Measure initial depth of water in each device. Measure changes in water level in each device at the same time measurements of the water level inside the structure are taken.
- h. Restart of test:
  - (1) The Engineer may order a restart of the test when, in the Engineer's opinion, measurements have become unreliable due to unusual precipitation or other factors.
  - (2) If measurements or observed leakage during the testing period indicate that the allowable leakage requirements will be exceeded, the test may be terminated before completion of the full test period. Take appropriate actions to correct problems before restarting the test.
- i. Calculations of leakage test results:
  - (1) For each section of the structure tested, use water surface level records to calculate average loss of volume per 24-hour interval.
    - (a) For each 24-hour interval during the test, calculate the average of all measured drops in water level around the structure.
    - (b) Use the average drop thus determined to calculate an average loss of volume for each 24-hour interval.

01480 – 6 of 10 Revised 06/03/21

- (2) Adjustments to leakage calculations:
  - (a) For uncovered basins, calculations shall be corrected for precipitation added to the structure.
  - (b) Calculations may be corrected for evaporation and water temperature.
- j. Evaluation criteria:
  - (1) Unless otherwise specified, the average loss of volume during any 24-hour interval shall not exceed the limits shown in Table A.

Table A - Loss of Volume Criteria for Leakage Tests				
Sti	ructure Type	Maximum Loss of Water Volume		
•	Structure fully lined prior to leakage test. Secondary containment areas.	No measurable loss over 72-hour test period.		
•	Structure with monolithically placed membrane floor slab.	0.0125 percent of volume per 24-hour period.		
•	Concrete paved canals, drying beds, lagoons, and similar structures.	0.100 percent of volume per 24-hour period.		
•	Other containment structures.	0.050 percent of volume per 24-hour period.		

- k. Repairs and retesting:
  - (1) Structures and portions of structures that have satisfied the qualitative requirements of HST-100, but have failed to satisfy the quantitative requirements of HST-100 may be immediately retested for volume loss.
    - (a) If the structure fails the second test for volume loss, the structure shall be drained, and the Contractor shall observe the interior for probable areas of leakage.
    - (b) The structure shall not be retested until repairs to the probable areas of leakage are complete.

## 3.05 REPAIRS FOR RETESTING

- A. Locations showing damp spots or flowing water:
  - 1. Mark locations of visible leaks and damp spots.
  - 2. Drain structures for repair.
  - 3. Repair defects causing damp spots and flowing water using methods specified in Section 03300 Cast-in-Place Concrete and approved by the Engineer.
    - a. Repair both interior and exterior surfaces and make structures watertight.
    - b. Submit proposed repair products and procedures for Engineer's review.
    - c. Refill structures for retesting.
  - 4. Repeat filling, observations, and repairs until no leaks or damp spots appear.
- B. Structures for which loss of water volume loss exceeds the limits specified after adjustments for evaporation, and precipitation:
  - 1. Determine cause of volume loss.

01480 – 7 of 10 Revised 06/03/21

- 2. Drain structures of water.
- 3. Repair defects causing loss of water volume using methods specified in Section 03300 Castin-Place Concrete and approved by the Engineer.
  - a. Submit proposed repair products and procedures for Engineer's review.
- 4. Refill water-holding structures.
- 5. Repeat testing and repairs until volume loss does not exceed specified limits.

# END OF SECTION

	FIGURE A							
			WATE	RTIGHTNESS TEST	REPORT			
PROJECT: SUBMITTED BY:								
STRUCTURE:			WITNESSED BY:					
AREA:		TEST DATES:						
TEST D	URATION:			TES	– TEST DURATION:			
		Sur	face area of structure to	ested:	(square fe	et)		
			Volume of structure t	ested:	(cubic feet	t)		
			Volume of structure t	ested:	(gallons)			
		Measu	ured loss through gates	, etc.:	(gallons / day)			
		Allo	owable loss of water vo	lume:	(per day)			
		Allo	wable loss of water volu	ume:		(% in 24 hours)		
Allov	wable meas	sured loss o	ver test duration (inche	s):				
			Measured loss of w	vater:		(gallons / day - Fr	rom E below)	
Measured loss of water volume (%):			(%):		(in 24 hours - Fro	m E below)		
Water Temperature: St			Start of test:	est: °F End of test: °		°F		
			Water Surfac	e Elevation (top o	f structure to top	of water)		
			Location #1	Location #2	Location #3	Location #4	Initials**	
Day	Date	Time	(inches)	(inches)	(inches)	(inches)		
1								
2								
3								
4								
5								
Changes in Level:								

A. Average change in level (feet): (Average of total charges for all locations)	
B. Correction for precipitation: (Measured from pan) -	(Measured from pan )
C. Correction for evaporation:	
D. Corrected change in level (CL):	
E. Total days tested:	(CL) x (surface area) x 100
Average measured % water loss in 24 F. hours:	
	(initial water volume) x (number of test days) Notes and
field observations	

 $\Box\Box$  Place date and initials at the beginning of each entry

#### 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 opening maybe 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. Site work is included in Division 02.
- B. Concrete is included in Division 03.
- C. 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 01500 – TEMPORARY FACILITIES

## PART 1 - GENERAL

## 1.01 SUMMARY

A. This specification covers the requirements for temporary construction facilities required on all projects.

## 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. Section 01000 General Project Requirements.
- B. Section 01015 Specific Project Requirements.
- C. Section 01300 Submittals.

# 1.04 CODES AND STANDARDS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- B. National Fire Protection Association:
  - 1. NFPA 10 Standard for Portable Fire Extinguishers.
  - 2. NFPA 70 National Electric Code.
  - 3. NFPA 241 Standard for Safeguarding Construction, Alternation and Demolition Operations.

## 1.05 INFORMATION PROVIDED BY THE CITY

A. As provided in the Contract Documents.

## 1.06 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.

## 1.07 QUALITY ASSURANCE

- A. The Contractor is responsible for the quality assurance and quality control of the Work.
- B. Regulations Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
  - 1. Building Code requirements.
  - 2. Health and safety regulations.
  - 3. Utility company regulations.
  - 4. Police, Fire Department and rescue squad rules.
- C. Standards:
  - 1. Comply with NFPA 10 and 241 and ANSI A10 Series standards "Temporary Electrical Facilities."
  - 2. Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

01500 – 1-1 of 3 Revised 05-08-20 D. Inspections – Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

# PART 2 - PRODUCTS - NOT USED.

# PART 3 - EXECUTION

## 3.01 OFFICE

- A. Stationary Office –Contractor shall maintain a suitable stationary office at or near the Site during the performance of the Work.
- B. Assigned Vehicle For projects of a certain scale and duration, the City will allow the Contractor to use an assigned vehicle to serve as a mobile office at the site of the Work.
- C. The office shall serve as the headquarters of the Contractor's representative authorized to receive Contract Documents, instructions, other communication or articles associated with the Work.
- D. Any communication given to the Contractor's representative or delivered to Contractor's office at the site of the Work shall be deemed to have been delivered to Contractor.
- E. Copies of the Contract Documents shall be kept at the office and shall be available for use at all times.

### 3.02 FIELD OFFICE FOR RESIDENT PROJECT REPRESENTATIVE

A. A field office for the Resident Project Representative is not required for this project.

## 3.03 TEMPORARY UTILITIES

- A. Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions and not violate applicable codes and standards.
- B. Power:
  - 1. All power for lighting, operations of the Contractor's plant/equipment or for any other use which may be required for proper completion of the Work shall be provided by the Contractor.
  - 2. Temporary heat and lighting shall be maintained until the Work is accepted.
- C. Telephone/internet service:
  - 1. Contractor shall make all necessary arrangements and pay all installation and monthly charges for telephone/internet service for the temporary office at the site and shall provide all required devices for such service.
- D. Sanitary Facilities:
  - 1. Contractor shall furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.
  - 2. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

3. Ventilate the units to control odors and fumes and empty and clean them at least once a week or more often if required by the City. The doors shall be self-closing. Locate the facility behind the construction fence or out of the public view.

# 3.04 SECURITY

A. See Section 01000 – General Project Requirements – SECURITY regarding the requirements for security.

## 3.05 PARKING

A. See Section 01000 – General Project Requirements – PARKING regarding the requirements for parking.

# 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.

- 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

01565 – 2 of 10 Revised 06/03/21

- (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
  - 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

01565 – 3 of 10 Revised 06/03/21

- 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.
  - 1. 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 wholebody 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.** 
  - 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".
  - 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.

01565 – 6 of 10 Revised 06/03/21

## PART 3 – EXECUTION

## 3.01 GENERAL

- 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 knifes, 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, preform 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.

01565 – 9 of 10 Revised 06/03/21

- 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

01566 - 2 of 3 Revised 05/08/20 Kansas City, Missouri Water Services Department Standard Specification
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.
  - When the washout container is filled to over 75 percent of its capacity, the washwater 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 01570 - TEMPORARY EROSION AND SEDIMENT CONTROL

# PART 1 – GENERAL

## 1.01 SUMMARY

- A. The Contractor shall provide erosion and sediment control measures for all areas within and adjacent to the Project site. The Contractor shall assume that the work is to be done under the City's General Operating Permit (Permit No: MOR100006). The Contractor does not need to make separate application to the Missouri Department of Natural Resources (MDNR).
- B. Specific erosion and sediment control measures are specified in APWA 5100 and Standard Erosion and Sediment Control (ESC) Drawings. These measures shall be implemented in order to control erosion and water pollution.
- C. No separate payment shall be made for Erosion and Sediment Control. The Contractor shall include in the lump sum total bid price: all labor, material and equipment necessary to comply with this Section and all other Work indicated in the Contract Documents.

#### 1.02 DESCRIPTION

- A. The Contractor shall install and maintain temporary erosion and sediment control devices prior to commencing construction operations and continue through the construction period until such time as seeding and sodding has been completed and turf is established on all graded areas.
- B. The Contractor shall prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) utilizing the latest version of the City's SWPPP template to develop the plan. The plan must include a narrative of the types and appropriate uses of Best Management Practices (BMPs) for erosion and sediment control and stormwater management. The requirements of the SWPPP must be as stringent as those described in the City's General Operating Permit (No: MOR100006) and 10 CSR 20-6.200. Additionally, the SWPPP must comply with the City of Kansas City's MS4 permit.
- C. Failure to control erosion and water pollution will result in the Contractor being noncompliant. Any noncompliance constitutes grounds for the following enforcement actions. The Contractor shall have 24 hours after receiving a notice of noncompliance from the City's representative (i.e. Project Manager, Design Professional, Inspector/ Representative of the City) to correct the problem. If weather conditions prevent the correction of BMPs within 7 calendar days, the reasons for the delay must be documented (including pictures) and there must be a narrative explaining why the work cannot be accomplished within the 7 day time period. The documentation must be filed with the regular inspection reports. The Contractor shall correct the problem as soon as weather conditions allow. 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 percent mark-up of the total contract price. If the Contractor continues to be noncompliant, the Director (or an authorized agent thereof) may issue a stop work order and delay any payment until control measures are properly functioning and any damage has been mitigated. In such an event, any delay to the Project schedule will result in liquidated damages assessed against the Contractor.

## 1.03 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.

01570 - 1 of 6 Revised 08/11/20 Kansas City, Missouri Water Services Department Standard Specifications

#### 1.04 RELATED SECTIONS

- A. Section 01000 General Project Requirements.
- C. Section 01300 Submittals.
- D. Section 02200 Earthwork.

## 1.05 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the Work. The Work shall be performed by a contractor with a proven record of performance for similar erosion and sedimentation control work.

# 1.06 INFORMATION PROVIDED BY THE CITY

A. As provided in the Contract Documents.

# 1.07 CONTRACTOR SUBMITTALS

- A. The Contractor shall submit to the City/Design Professional for review and approval, in accordance with Section 01300 Submittals, all specifications and data covering the proposed materials to be used for erosion and sedimentation control work.
- B. The Contractor shall submit the following to the City/Design Professional for review and approval prior to the preconstruction conference:
  - 1. The Contractor shall prepare a Stormwater Pollution Prevention Plan (SWPPP) for Projects that disturb one or more acres of land or disturb less than one acre when part of a larger Project which will disturb one or more acres over the life of the Project.
  - 2. The SWPPP shall meet the requirements of this Section, applicable references on the plans, the City's adopted <u>Erosion and Sediment Control Specifications</u> (ESCS), and all sections of the APWA-KCMO specifications that reference erosion control requirements. The Contractor shall develop, implement, and adhere to the erosion control and stormwater pollution prevention plan based upon the City's guidelines and requirements.
  - 3. No work can begin until the SWPPP is approved by the City/Design Professional.
  - 4. The Contractor shall update and maintain the SWPPP as necessary to develop ongoing site-specific control measures until final acceptance of the Project.

## PART 2 – PRODUCTS

- A. Unless otherwise specified in Section 01000 General Project Requirements, acceptable products for Inlet Protection include the following:
  - 1. Gutter Buddy, Dandy Curb® or approved equal.

## PART 3 – EXECUTION

## 3.01 SAFETY

A. Perform all work in accordance with applicable Occupational Safety and Health Administration (OSHA) standards.

## 3.02 PERFORMANCE

- A. City Projects are covered by a general NPDES permit maintained by the Water Services Department's Storm Water Division. The Permit imposes a number of obligations including, but not limited to, the following:
  - 1. New Projects must be reported to the MDNR 90 days before the Project starts.
  - 2. Each site must have and follow a written Storm Water Pollution Prevention Plan (SWPPP). Each site must be inspected weekly and following each rain event, for compliance with the SWPPP. Written inspection reports must be kept.
  - 3. All personnel on site must be briefed on the requirements of the SWPPP.
  - 4. A copy of the SWPPP must be on site at all times.
  - 5. All deficient items shall be promptly corrected. In no case shall the correction period exceed two calendar days.
  - 6. Quarterly reports must be filed by the City with MDNR identifying and giving the status and percent complete of each Project.
  - 7. MDNR must be notified if hazardous substances or contaminated soil are discovered on site.
- B. The Contractor shall follow the approved SWPPP, as well as all erosion control measures included in the Contract Documents and implement other BMP measures as directed by the City/Design Professional.
- C. The Contractor shall prevent erosion during his operations until vegetation is reestablished. The Contractor shall prepare erosion control plans and submit in writing to the City/Design Professional any proposed modifications to the plans. The proposed modifications shall describe materials that will be used and the tasks that will be performed to control runoff on the site.
- D. Erosion control devices shall be in place before land is disturbed.
- E. All earthen structures shall be seeded or sodded.
- F. Vegetation shall be established to provide adequate protection or develop other suitable means.
- G. Sediment trapping devices shall been installed in the proper location prior to grading.
- H. The Contractor shall establish perimeter sediment trapping measures that function properly.
- I. The Contractor shall prevent sediment from leaving the site and/or from damaging adjacent property.
- J. The Contractor shall prevent and or remove mud on public roads or at intersections with public roads that is related to the Project work being completed.
- K. The Contractor shall provide a temporary construction entrance to reduce/eliminate the transport of mud from the construction site onto public right of ways.
- L. The Contractor shall provide dust control measures for any graveled areas or exposed soil areas. See Section 01000 General Project Requirements, paragraph DUST CONTROL for additional requirements.
- M. The Contractor shall temporarily or permanently stabilize all areas with exposed soil.
- N. The Contractor shall adequately stabilize all finished cut and fill slopes.
- O. All on-site drainage channels and outlets shall be adequately stabilized.
- P. Route stream around work areas.
- Q. Repair stream channel damages per the Contract Documents.
- R. Provide stabilization or a temporary stream channel crossing where needed.

01570 - 3 of 6 Revised 08/11/20 Kansas City, Missouri Water Services Department Standard Specifications

01570 - 4 of 6 Revised 08/11/20 Kansas City, Missouri Water Services Department Standard Specifications

#### 3.03 INSTALLATION

- A. Methods, materials and maintenance shall be the sole responsibility of the Contractor. The Contractor and the City/Design Professional shall conduct weekly onsite inspections using the "Erosion and Sediment Control Checklist" provided by the Water Services Department. Remove any onsite pollutant sources (debris piles with petroleum cans, chemical containers, fueling trucks/tanks or other possible sources of pollution). Upon notification of a weather forecast with a reasonable likelihood of rain, or at the direction of the City/Design Professional, the Contractor shall construct temporary berms and install erosion control fencing as necessary to control the potential eroded sediment and prevent it from leaving the construction area. If the Contractor's construction operations are complete to the point where seeding or sodding is out-of-season or disallowed by the City/Design Professional, the Contractor shall construct one of the following erosion control measures:
  - 1. Incorporate the use of erosion control fencing immediately downstream of vulnerable areas that are susceptible to the formation of small streams. Maintain the erosion control devices until seeding or sodding season returns. Upon return of the sodding season, the area shall be re-graded to the lines and grades established in the Contract Drawings and sodded at the direction of the City/Design Professional.
  - 2 Terrace the ground with graded berms and incorporate the use of both temporary slope drains (See ESCS Section 10.03.4.3 and Section 02200 Earthwork for additional requirements) and erosion control fencing (as specified in this Section). Maintain the erosion control devices until seeding or sodding season returns. Upon return of the seeding or sodding season, the area shall be re-graded to the lines and grades established in the Contract Drawings and seeded/sodded at the direction of the City/Design Professional.
  - 3. Fertilize, place seed or sod, and irrigate as directed by APWA-KCMO 2400. Maintain the erosion control devices until seeding or sodding season returns. Upon return of the seeding or sodding season the Contractor shall re-establish the grade and replace all dead seed or sod at the direction of the City/Design Professional.
- B. Silt fence shall be installed, inspected and maintained in accordance with APWA ESC–10.
- C. Berms shall be constructed in accordance to APWA ESC–29:
  - 1. Berms are required if the silt fence is not installed or properly maintained.
  - 2. Inspection shall be frequent and repair or replacement shall be made promptly as needed.
  - 3. Remove sediment deposits as necessary to provide adequate storage volume for the next rain.
  - 4. The Contractor shall remove berms when they have served their usefulness.
  - 5. Sediment trapped by this practice shall be uniformly distributed on the source area prior to seeding or sodding.
- D. The Rock Check Dam shall be constructed, inspected and maintained in accordance to APWA ESC-15.

- E. Inlet Protection. Work covered under this item consists of installing a Gutter Buddy, Dandy Curb® or equal inlet protection system for inlets and median barrier inlets without grates. The purpose is to keep silt, sediment and construction debris out of the storm system:
  - 1. The inlet protection system shall be a sewn fabric unit enclosing a porous structure in the form of a cylindrical tube placed in front of and extending beyond the inlet opening on both sides.
  - 2. Place inlet protection unit on the street with aggregate pouch near the inlet it will be installed to protect.
  - 3. For oil and sediment, place absorbent in the sock tube.
  - 4. Center the unit against curb or median inlet opening so that the curb side of the unit creates a seal with the curb or median barrier and inlet structure. There will be approximately twelve (12) inches of the inlet protection unit overhanging on each side of the opening. If the unit is not installed in this manner, it will not function properly.
  - 5. The Contractor shall remove all accumulated sediment and debris from in front of the unit and from the street surface in the vicinity of every installed unit after each rain event or as directed by the City/Design Professional. Dispose of the unit at an appropriate recycling or solid waste facility when the unit is no longer being used.
  - 6. Oil and sediment. Remove and replace absorbent when near saturation.

## 3.04 MAINTENANCE AND REPAIR

- A. The Contractor is responsible for maintaining all erosion and sediment control measures until acceptance of the Project by the City.
- B. Erosion control measures showing evidence of overtopping, breaks or erosion shall be repaired or replaced with suitable materials.
- C. All storm sewer inlets shall be regularly maintained so that sediment will not enter the system.
- D. Repair and clean-out all control measures that are not functioning properly.
- E. Remove temporary measures that are no longer needed.
- F. Seeded or sodded areas requiring maintenance (fertilizer, re-sodding, re-seeding or additional mulch and watering) shall be promptly addressed.

## 3.05 WARRANTY

A. Seeding and sodding work shall have taken root and established satisfactory coverage before acceptance by the City. The Contractor shall maintain as described in paragraph 3.04 above and shall guarantee seeding and sodding for one (1) year after acceptance. The Contractor shall scarify, re-seed or re-sod, fertilize and mulch (seeded areas) any barren area greater than 1 square foot.

# END OF SECTION

# SECTION 01580 – PROJECT SIGNS

# PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Contractor shall provide all material, labor and equipment necessary for the fabrication, printing and installation of Project signs.
- B. This section covers project sign requirements for all Kansas City, Missouri Water Services Department projects. Project sign requirements include the following:
  - 1. Project identification sign description.
  - 2. Project sign installation.
  - 3. Maintenance and removal of Project sign.
  - 4. Printing of signs.
  - 5. Installation of signs.

# 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 Drawings.

## 1.03 RELATED SECTIONS

- A. Section 01015 Specific Project Requirements.
- B. Section 01300 Submittals.
- C. Section 01581 Public Communications.

## 1.04 INFORMATION PROVIDED BY THE CITY

A. City shall provide the graphic design templates of the Project sign in an electronic format to be used in the printing process.

#### 1.05 SUBMITTALS

- A. Submit as specified in Section 01300 Submittals.
- B. Shop Drawings (not used).
- C. Product Data (not used).
- D. Samples.
- E. Other:
  - 1. Project Sign Locations submit for review and approval a map of the Project area of marked up Drawings showing the location and orientation of each project sign.
  - 2. Submit for review and approval notifications to homeowners and business adjacent to the location of the Project signs.
  - 3. Re-use of Placards if the Contractor has salvaged placards from previous projects, they may be re-used if approved by the City. Submit color photographs that accurately show the condition of each placard to be re-used for review and approval.
  - 4. Notice of Removal submit written notification to City that all Project signs have been removed.

# PART 2 - PRODUCTS

## 2.01 PRINTERS

A. A list of printing companies that have previous experience with printing signs for the City are included in Section 01015 – Specific Project Requirements.

## 2.02 FRAME

A. Metal frame and hardware shall be in conformance with Water Services standard detail D-20142 – Installation Detail for Project Signs (see Figure 3).

## 2.03 PLACARDS

- A. Upper Placard Size 6 feet wide by 4 feet tall.
- B. Lower Placard Size 6 feet wide by 1 foot tall.
- C. Material Coroplast® corrugated plastic sheeting or approved equal.
- D. Sheeting Thickness  $-\frac{1}{2}$  inch.
- E. Sheeting Color white.
- F. Print Method direct to Coroplast® with outdoor UV laminate coating.

# 2.04 PLACARD CONTENT

- A. Construction Phase Upper Placard for each Project sign the Contractor shall provide an upper placard which will be displayed through construction. An example of the Construction Phase Upper Placard is shown in Figure 1.
- B. Post-Construction Phase Upper Placard for each Project sign the Contractor shall provide an upper placard which will be displayed post construction. An example of the Construction Phase Upper Placard is shown in Figure 2.
- C. Lower Placard for each Project sign, the Contractor shall provide a lower placard. Examples of the Lower Placard are shown in Figures 1 and 2.
- D. The City will provide digital files for all placards and graphic images.

## 2.05 NUMBER OF SIGNS TO BE PROVIDED

- A. The number of project signs to be provided is defined in Section 01015 Specific Project Requirements. Each Project sign includes the following:
  - 1. One (1) Construction Phase Upper Placard to be displayed during construction.
  - 2. One (1) Post-Construction Phase Upper Placard to be displayed after completion of the Work.
  - 3. One (1) Lower Placard to be displayed during construction and post-construction.
  - 4. Printing of placards.
- B. Frame as shown in Water Services standard detail D-20142 Installation Detail for Project Signs (see Figure 3).

## PART 3 - EXECUTION

## 3.01 INSTALATION AND PLACEMENT OF SIGNS

 A. Installation – Project signs shall be fabricated and installed in accordance with Water Services standard detail D-20142 – Installation Detail for Project Signs (see Figure 3).

- B. Location Project signs shall be located within the Site as defined by Section 00700 General Conditions. Project signs shall be erected in a conspicuous place but shall not interfere with the vision of pedestrian or vehicular traffic such as to create a hazard. Signs shall be located in the public right of way or in an easement acquired for the Project. Locations of the signs shall be coordinated with the City prior to installation and submitted accordance with paragraph 1.05 SUBMITTALS.
- C. Notifications the Contractor shall notify any homeowners or businesses adjacent to the location of the signs at least three (3) days prior to erecting signs.
- D. Project sign(s) shall be erected not less than two (2) days before the start of construction activities. No construction activities are allowed until the Project signs are erected.
- E. Project signs shall remain in place for the duration of the Project and shall be maintained in a true, plumb and neat condition.

#### 3.02 REPLACEMENT OF UPPER PLACARDS

- A. Upon completion of the Work and at the direction by the City, the Contactor shall remove the Construction Phase Upper Placard (Figure 1) on all Project signs and replace them with the Post-Construction Upper Placard (Figure 2).
- B. The Lower Placards are to remain in place.

#### 3.03 REMOVAL OF PROJECT SIGNS

- A. All Project signs shall be maintained for thirty (30) calendar days after completion of the Work or as otherwise directed by the City.
- B. Contractor shall remove all Project signs and restore the area disturbed by construction activities.
- C. Project signs shall be removed from the Project areas and will become property of the Contractor.
- D. The Contractor may dispose of Project signs or salvage and reuse them on future City projects. The City will assess the condition of the signs and determine the appropriateness of reuse.
- E. Within three (3) days of the removal of signs, Contractor shall provide the City written notice that all Project signs have been removed from the Site.



Figure 1 – Example Construction Phase Upper Placard and Lower Placard



Figure 2 – Example Post-Construction Phase Upper Placard and Lower Placard





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.

01581 – 1 of 9 Revised 08-17-20 Kansas City, Missouri Water Services Department Standard Specification

# 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.

01581 – 2 of 9 Revised 08-17-20 Kansas City, Missouri Water Services Department Standard Specification 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.



Figure 1 – Restricted Access Door Hanger



Figure 2 – Smoke Testing Door Hanger







Figure 4 – Wastewater Service Interruption Door Hanger







Figure 6 – Work Notice Door Hanger

END OF SECTION

Kansas City, Missouri Water Services Department Standard Specification

## SECTION 01600 - PRODUCT DELIVERY STORAGE AND HANDLING

#### PART 1 - GENERAL

#### 1.01 SUMMARY

A. Section includes: Product requirements; product selection; product options and substitutions; quality assurance; shipping, delivery, handling, and storage; and instructions for spare parts, maintenance products, and special tools.

#### 1.02 REFERENCES

- A. American National Standards Institute (ANSI).
- B. NSF International (NSF):
  - 1. 61 Drinking Water System Components Health Effects.
  - 2. 372 Drinking Water System Components Lead Content.

#### **1.03 RELATED SECTIONS**

- A. Section 01019 Closeout Procedures.
- B. Section 01021 Operation Maintenance Data.
- C. Section 01300 Submittals.
- D. Section 01630 Substitution Request Form.
- E. Section 01757 Commissioning.
- F. Section 01810 Project Design Criteria.
- G. Section 09960 High-Performance Coatings.

#### **1.04 DEFINITIONS**

- A. Products: Inclusive of raw materials, finished goods, equipment, systems, and shop fabrications.
- B. Special tools: Tools that have been specifically made for use on a product for assembly, disassembly, repair, or maintenance.

#### 1.05 SUBMITTALS

- A. As specified in Section 01300 Submittals.
- B. Calculations/certifications in accordance with NSF 61 and 372 for materials in contact with drinking water.

#### **1.06 GENERAL REQUIREMENTS**

- A. Comply with Specifications and referenced standards as minimum requirements.
- B. Provide products by same manufacturer when products are of similar nature, unless otherwise specified.
- C. Provide like parts of duplicate units that are interchangeable.
- D. Provide equipment that has not been in service prior to delivery, except as required by tests.
- E. When necessary, modify manufacturer's standard product to conform to specified requirements or requirements indicated on the Drawings.

#### 1.07 SUBSTITUTIONS

- A. Formal substitution request procedure:
  - 1. Submit a written formal substitution request to Engineer for each proposed substitution within 30 days of effective date of Contract.
  - 2. Engineer will return initial opinion and request for additional information within 30 days.
  - 3. Engineer will notify Contractor in writing of decision to accept or reject the substitution request within 30 days of receiving required information.
- B. Formal substitution request contents:
  - 1. Provide Substitution Request Form as specified in Section 01630 Substitution Request Form.
  - 2. Manufacturer's literature including:
    - a. Manufacturer's name and address.
    - b. Product name.
    - c. Product description.
    - d. Reference standards.
    - e. Certified performance and test data.
    - f. Operation and maintenance data.
  - 3. Samples, if applicable.
  - 4. Shop drawings, if applicable.
  - 5. Reference projects where the product has been successfully used:
    - a. Name and address of project.
    - b. Year of installation.
    - c. Year placed in operation.
    - d. Name of product installed.
    - e. Point of contact: Name and phone number.
  - 6. Itemized comparison of the proposed substitution with product specified including a list of significant variations:
    - a. Design features.
    - b. Design dimensions.
    - c. Installation requirements.
    - d. Operations and maintenance requirements.
  - 7. Define impacts:
    - a. Impacts to construction schedule.
    - b. Impacts to other contracts.
    - c. Impacts to other work or products.
    - d. Impact to Contract Sum:
      - (1) Do not include costs under separate contracts.
      - (2) Do not include Engineer's costs for redesign or revision of Contract Documents.
      - (3) Required license fees or royalties.
    - e. Availability of maintenance services and sources of replacement materials.
  - 8. Contractor represents the following:
    - a. Contractor shall pay associated costs for the Engineer to evaluate the substitution.
    - b. Contractor bears the burden of proof of the equivalency of the proposed substitution.

01600 – 2 of 7 Revised 06/03/21

- c. Proposed substitution does not change the design intent and will have equal performance to the specified product.
- d. Proposed substitution is equal or superior to the specified product.
- e. Contractor will provide the warranties or bonds that would be provided on the specified product on the proposed substitution, unless Owner requires a Special Warranty.
- f. Contractor will coordinate installation of accepted substitution into the Work and will be responsible for the costs to make changes as required to the Work.
- g. Contractor waives rights to claim additional costs caused by proposed substitution which may subsequently become apparent.
- C. Substitutions will not be considered for acceptance under the following conditions:
  - 1. No formal substitution request is made.
  - 2. The substitution is simply implied or indicated on shop drawings or product data submittals.
  - 3. The formal substitution request is submitted by a subcontractor or supplier.
- D. Substitution requests submitted after the deadline will not be considered unless the following evidence is submitted to the Engineer:
  - 1. Proof that the specified product is unavailable for reasons beyond the control of the Contractor.
    - a. Reasons may include manufacturing discontinued, bankruptcy, labor strikes, or acts of God.
    - b. Contractor placed or attempted to place orders for the specified products within 10 days after the effective date of the Agreement.
    - c. The formal substitution request is submitted to Engineer within 10 days of the Contractor discovering the specified product cannot be obtained.
- E. Engineer's decision on a substitution requests will be final and binding.
  - 1. Approved substitutions will be incorporated into the Contract Documents with a Change Order.
  - 2. Requests for time extensions and additional costs based on submission of, approval of, or rejection of substitutions will not be allowed.

## PART 2 – PRODUCTS

## 2.01 GENERAL

- A. Material requirements:
  - 1. Materials: Provide corrosion resistance suitable for project conditions as specified in Section 01810 Project Design Criteria.
  - 2. Dissimilar metals: Separate contacting surfaces with dielectric material.
- B. Edge grinding:
  - 1. Sharp projections of cut or sheared edges of ferrous metals which are not to be welded shall be ground to a radius required to ensure satisfactory paint adherence.

## 2.02 PRODCUTS IN CONTACT WITH DRINKING WATER

- A. Materials in contact with drinking waters: In accordance with NSF 61 and NSF 372.
  - 1. Certification by an independent ANSI accredited third party, including, but not limited to, NSF International, as being lead free.

# 2.03 PRODUCT SELECTION

- A. When products are specified by standard or specification designations of technical societies, organizations, or associations only, provide products that meet or exceed reference standard and Specifications.
- B. When products are specified with names of manufacturers but no model numbers or catalog designations, provide:
  - 1. Products by one of named manufacturers that meet or exceed Specifications.
  - 2. Engineer deemed "or equal" evidenced by an approved shop drawing or other written communication.
- C. When products are specified with names of manufacturers and model numbers or catalog designations, provide:
  - 1. Products with model numbers or catalog designations by one of named manufacturers.
  - 2. Engineer deemed "or equal" evidenced by an approved shop drawing or other written communication.
- D. When products are specified with names of manufacturers, but with brand or trade names, model numbers, or catalog designations by one manufacturer only, provide:
  - 1. Products specified by brand or trade name, model number, or catalog designation.
  - 2. Products by one of named manufacturers proven, in accordance with requirements for an "or equal", to meet or exceed quality, appearance and performance of specified brand or trade name, model number, or catalog designation.
  - 3. Engineer deemed "or equal" evidenced by an approved shop drawing or other written communication.
- E. When Products are specified with only one manufacturer followed by "or Equal," provide:
  - 1. Products meeting or exceeding Specifications by specified manufacturer.
  - 2. Engineer deemed "or equal" evidenced by an approved shop drawing or other written communication.

# 2.04 SHIPMENT

- A. Mandatory requirements prior to shipment of equipment:
  - 1. Engineer approved shop drawings.
  - 2. Engineer approved Manufacturer's Certificate of Source Testing as specified in Section 01757 Commissioning, when required by specifications.
  - 3. Draft operations and maintenance manuals, as specified in Section 01783 Operation and Maintenance Data, when required by specifications.
- B. Prepare products for shipment by:
  - 1. Tagging or marking products to agree with delivery schedule or shop drawings.
  - 2. Including complete packing lists and bills of material with each shipment.
  - 3. Packaging products to facilitate handling and protection against damage during transit, handling, and storage.
  - 4. Securely attach special instructions for proper field handling, storage, and installation to each piece of equipment before packaging and shipment.
- C. Transport products by methods that avoid product damage.
- D. Deliver products in undamaged condition in manufacturer's unopened containers or packaging.

## 2.05 SPARE PARTS, MAINTENANCE PRODUCTS, AND SPECIAL TOOLS

- A. Provide spare parts and maintenance products as required by Specifications.
- B. Provide one set of special tools required to install or service the equipment.
- C. Box, tag, and clearly mark items.
- D. Contractor is responsible for spare parts, maintenance products, and special tools until acceptance by Owner.
- E. Store spare parts, maintenance products, and special tools in enclosed, weatherproof, and lighted facility during the construction period.
  - 1. Protect parts subject to deterioration, such as ferrous metal items and electrical components with appropriate lubricants, desiccants, or hermetic sealing.
- F. Provide spare parts and special tools inventory list, see Appendix A:
  - 1. Equipment tag number.
  - 2. Equipment manufacturer.
  - 3. Subassembly component, if appropriate.
  - 4. Quantity.
  - 5. Storage location.
- G. Store large items individually:
  - 1. Weight: Greater than 50 pounds.
  - 2. Size: Greater than 24 inches wide by 18 inches high by 36 inches long.
  - 3. Clearly labeled:
    - a. Equipment tag number.
    - b. Equipment manufacturer.
    - c. Subassembly component, if appropriate.
- H. Store in spare parts box smaller items:
  - 1. Weight: Less than 50 pounds.
  - 2. Size: Less than 24 inches wide by 18 inches high by 36 inches long.
  - 3. Clearly labeled:
    - a. Equipment tag number.
    - b. Equipment manufacturer.
    - c. Subassembly component, if appropriate.
- I. Spare parts and special tools box:
  - 1. Wooden box:
    - a. Size: 24 inches wide by 18 inches high by 36 inches long.
  - 2. Hinged wooden cover:
    - a. Strap type hinges.
    - b. Locking hasp.
    - c. Spare parts inventory list taped to underside of cover.
  - 3. Coating: As specified in Section 09960 High-Performance Coatings.
  - 4. Clearly labeled:
    - a. The words "Spare Parts and/or Special Tools".
    - b. Equipment tag number.
    - c. Equipment manufacturer.

01600 – 5 of 7 Revised 06/03/21

## PART 3 – EXECUTION

## 3.01 DELIVERY AND HANDLING

- A. Handle equipment in accordance with manufacturer's instructions.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.
- C. Upon delivery, promptly inspect shipments:
  - 1. Verify compliance with Contract Documents, correct quantities, and undamaged condition of products.
  - 2. Acceptance of shipment does not constitute final acceptance of equipment.

## 3.02 STORAGE AND PROTECTION

- A. Immediately store and protect products and materials until installed in Work.
- B. Store products with seals and legible labels intact.
- C. Maintain products within temperature and humidity ranges required or recommended by manufacturer.
- D. Protect painted surfaces against impact, abrasion, discoloration, and other damage.
  - 1. Repaint damaged painted surfaces.
- E. Exterior storage of fabricated products:
  - 1. Place on aboveground supports that allow for drainage.
  - 2. Cover products subject to deterioration with impervious sheet covering.
  - 3. Provide ventilation to prevent condensation under covering.
- F. Store moisture sensitive products in watertight enclosures.
- G. Furnish covered, weather-protected storage structures providing a clean, dry, noncorrosive environment for mechanical equipment, valves, architectural items, electrical and instrumentation equipment and special equipment to be incorporated into this project.
  - 1. Storage of equipment shall be in strict accordance with the "instructions for storage" of each equipment supplier and manufacturer including connection of heaters, placing of storage lubricants in equipment, etc.
  - 2. The Contractor shall furnish a copy of the manufacturer's instructions for storage to the Engineer prior to storage of all equipment and materials.
  - 3. Pumps, motors, 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.
- H. Unless otherwise instructed by or required by the equipment manufacturer:
  - 1. Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc.
  - 2. Equipment having moving parts shall be rotated a minimum of twice a month to ensure proper lubrication and to avoid metal to metal "welding".
- I. Store loose granular materials on solid surfaces in well-drained area.
  - 1. Prevent materials mixing with foreign matter.
  - 2. Provide access for inspection.
- J. Payment will not be made for equipment and materials improperly stored or stored without providing Engineer with the manufacturer's instructions for storage.

01600 – 6 of 7 Revised 06/03/21 K. Provide an Equipment Log including, as a minimum, the equipment identification, date stored, date of inspection/maintenance, date removed from storage, copy of manufacturer's recommended storage guidelines, description of inspection/maintenance activities performed, and signature of party performing inspection/maintenance.

# 3.03 PROTECTION AFTER INSTALLATION

- A. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations.
  - 1. Remove covering when no longer needed.
  - 2. Replace corroded, damaged, or deteriorated equipment and parts before acceptance of the project.
- B. Update Equipment Log on a monthly basis with description of maintenance activities performed in accordance with the manufacturer's recommendation and industry standards and signature of party performing maintenance.
- C. Upon installation of the equipment, Contractor shall, at the discretion of Engineer, start the equipment at one-half load for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
- D. Unless otherwise instructed by or required by the equipment manufacturer, lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment by Contractor at the time of acceptance.

## 3.04 QUALITY ASSURANCE

- A. Employ entities that meet or exceed specified qualifications to execute the Work.
- B. Verify project conditions are satisfactory before executing subsequent portions of the Work.

# 3.05 COMMISSIONING

A. As specified in Section 01757 - Commissioning.

# 3.06 CLOSEOUT ACTIVITIES

- A. Owner may request advanced delivery of spare parts, maintenance products, and special tools.
  - 1. Deduct the delivered items from the inventory list and provide transmittal documentation.
- B. Immediately prior to the date of Substantial Completion, arrange to deliver spare parts, maintenance products, and special tools to Owner at a location on site chosen by the Owner.
  - 1. Provide itemized list of spare parts and special tools that matches the identification tag attached to each item.
  - 2. Owner and Engineer will review the inventory and the itemized list to confirm it is complete and in good condition prior to signing for acceptance.

# 3.07 ATTACHMENTS

A. Appendix A - Spare Parts, Maintenance Products, and Special Tools Inventory List.

## END OF SECTION

01600 – 7 of 7 Revised 06/03/21

## SECTION 01615 - EQUIPMENT IDENTIFICATION AND TAGGING

PART 1 - GENERAL

A. The following is a guide to the various types of tags used for KC Water (Wastewater Division) asset identification.

#### 1.01 SUMMARY

- B. This section describes tag structures KC Water uses to label an asset for different purposes. These tags include:
  - 1. CMMS tags (Asset IDs)
    - a. These tags are used to identify assets in CITY's CMMS (Computerized Maintenance Management System.
    - b. CMMS is primarily used for maintenance scheduling and financial tracking of assets.
    - c. Not every asset will need an Asset ID, reference CITY's Tag Generator Spreadsheet for more details about which assets need this type of tag.
      - (1) CMMS tags for all new assets will be created using the CITY's Tag Generator Spreadsheet.
  - 2. PLC Shortcuts
    - a. Shortcuts are used in the OIT (Operator Interface Terminal)/HMI (Human Machine Interface) to establish a path from the HMI to the PLC.
    - b. These tags are only used to identify/label PLCs.
    - c. See CITY SCADA Standards for more details.
  - 3. P&ID Tags
    - a. These tags are used to identify equipment and instruments on P&IDs (Process and Instrumentation Drawings).
    - b. These tags are composed of a 3-5 digit equipment or instrument code followed by a 5 digit loop number.
    - c. See CITY P&ID tagging standards for more details.
  - 4. PlantPax Tags
    - a. PlantPax Tags are used in the PLC program as object names for all standard PlantPax objects.
    - b. The tagging convention for these tags is based on ANSI/ISA Table 4.1 and also utilizes the loop numbers from the P&ID's
    - c. See SCADA Standards for more details.
  - 5. NonPlantPax Tags
    - a. NonPlantPax tags are used for objects that are not in the standard PlantPax library of objects. This might include objects that a vendor has created or possibly objects that a local integrator might need to create for specialty equipment that doesn't already have an object type in the standard PlantPax library.

- 6. Other Tags/Names (See SCADA Standards for details)
  - a. HMI Application/Display Names.
  - b. OIT Application Names.
  - c. Thin/Thick Client Names.
  - d. ControlLogix PLC Program Filenames.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION





# SUBSTITUTION REQUEST

Project Number 81000928/1662

Project Title Birmingham Pump Station Screen Replacement

KANSAS CITY MISSOURI

To: Re:		Authorization Number: 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: Differences between prop	□ 2-5 years old □ 5-10 years osed substitution and specified pro	old 📮 More than 10 years old oddatte

#### Department 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
· · ·	•

Supporting Data	a Attached: a   Drawings   D Tests   D Reports   D Samples   D
Attachments:	
Submitted by:	
Signature:	
Firm:	
Address:	
Telephone:	Fax <sup>.</sup> F-Mail <sup>.</sup>
- elephene: <u></u>	
Additional Com	ments:
DESIGN PROF Substitut Substitut Substitut Substitut	<b>ESSIONAL'S REVIEW AND ACTION</b> ion approved – Make submittals in accordance with Specification Section 01300. ion approved as noted – Make submittals in accordance with Specification Section 01300. ion rejected – Use specified materials. ion Request received too late – Use specified materials.
Signed by:	Date:
<b>D</b>	
Distribution:	<ul> <li>Owner</li> <li>Design Professional</li> <li>Contractor</li> <li>Consultant</li> <li>Construction Manager</li> <li>Other</li> </ul>

#### SECTION 01664 - TRAINING

#### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. This section contains requirements for training the Owner's personnel by the Manufacturer's Representative in the proper operation and maintenance of the equipment and systems installed under this contract and other training required to operate the Works.
- B. Training outcomes: Owner's operations, maintenance, and engineering staff have the information needed to safely operate, maintain, and repair the equipment/systems provided in the Contract Documents.

#### **1.02 RELATED SECTIONS**

- A. Section 01021 Operation Maintenance Data.
- B. Section 01300 Submittals.
- C. Section 01757 Commissioning.

#### 1.03 QUALITY ASSURANCE

- A. Where indicated in the Equipment Schedule and as required by the detailed 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 familiar with operation and maintenance manual information specified in Section 01783 Operation and Maintenance Data. Commissioning Manager may perform other training sessions as approved by the Owner's Representative.
- B. Trainers shall be knowledgeable in the equipment/system for which they are training. Trainer's qualifications shall be submitted in a form provided by the Owner and specifically demonstrating operational knowledge of the specific systems and components and treatment facility classroom and field training experience.

#### 1.04 SUBMITTALS

- A. The following information shall be submitted to the Engineer and Owner in accordance with the provisions of the Submittal Procedures section (Section 01300).
- B. Lesson plans for each training session to be conducted by the manufacturer's representatives. Lessons plans shall be submitted 45 days prior to the scheduled training. In addition, training manuals, handouts, visual aids, and other reference materials shall be included.
- C. Subject of each training session, instructor (s) and qualifications of individuals conducting the training, and tentative date and time of each training session. Owner has the right to request instructor substitution that are not appropriately qualified.
- D. Training schedule including respective manufacturer, estimated dates for installation completion and estimated training dates will be incorporated into the project schedule in the commissioning section consistent with direction provided by the Owner's affected facility or division.

01664 – 1 of 9 Revised 06/03/21

- E. Submit other audio-visual aids utilized during each training course.
- F. Provide two electronic copies and 3 hard copies organized in notebooks of the training course material 7 days prior to training.

#### PART 2 – PRODUCTS

#### 2.01 GENERAL

- A. Where specified, the Contractor's or Design-Builder's Commissioning Manager 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.
- B. 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. Furnish a copy of each complete training package, to include operation and maintenance data for distribution to each trainee.
- C. Commissioning Manager shall meet with Engineer and Owner's designated training Manager to develop a list of personnel to be trained and to establish expected training outcomes and objectives 120 days prior to commissioning of equipment/system and schedule the training.
- D. Commissioning Manager shall conduct commissioning progress meetings throughout construction to plan, scope, coordinate, schedule future activities and resolve issues at least monthly. This meeting may be part of the weekly progress meetings.

## 2.02 LOCATION

A. Training sessions shall take place at the site of the work or at the Water Services Department offices as determined by the Owner.

## 2.03 LESSON PLANS

- A. 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 and time spent on each form of training.
- B. Lesson plans shall contain the following minimum information:
  - 1. Title and objectives
  - 2. Recommended attendees (i.e. managers, engineers, operators, maintenance)
  - 3. Course description, outline of course content, and estimated class duration.
  - 4. Format (i.e. lecture, self-study, demonstration, hands-on)
  - 5. Instruction materials and equipment requirements.
  - 6. Resumes of instructors providing training.
  - 7. Provide performance-based learning objectives.
  - 8. State learning objectives in terms of what the trainees will be able to do at the end of the lesson.
  - 9. Define student conditions of performance and criteria utilizing learning objectives for evaluating instructional success.
  - 10. Provide necessary information for submission to MDNR for approval of training hours in compliance with certified operator regulations for certificate renewal.
  - 11. Correspondence that a submission to MDNR for training hours has been completed and approved.

01664 – 2 of 9 Revised 06/03/21

- 12. Provide maintenance instruction lessons plans to include mechanical, HVAC, instrumentation, and electrical aspects.
- 13. Equipment operation:
  - a. Describe equipment process function and system theory.
  - b. Describe equipment fundamental operating principles and dynamics.
  - c. Identify equipment mechanical, electrical, and electronic components and features.
  - d. Identify support equipment associated with the operation of subject equipment.
  - e. Detail the relationship of each piece of equipment or component to the subsystems, systems, and process.
  - f. Cite hazards associated with the operations, exposure to chemicals associated with the component, or the waste stream handled by the component.
  - g. Specify appropriate safety precautions, equipment, and procedures to eliminate, reduce, or overcome hazards.
- 14. Detailed component description:
  - a. Define preventative maintenance (PM) inspection procedures required on equipment in operation and identify troubleshooting and potential issues as a result of the troubleshooting,
  - b. Identify predictive maintenance PdM that may be applicable (infrared analyses, oil evaluation, vibration analyses) to the component or system.
  - c. Identify preventive maintenance tasks and frequencies and provide in a table.
  - d. Identify each component function and describe in detail.
  - e. Where applicable, group relative components into subsystems.
  - f. Identify and describe in detail equipment safety features, permissives and controls interlocks.
- 15. Define and provide training on recommended systematic troubleshooting procedures as they relate to specific craft problems and provide component specific troubleshooting checklists as they relate to specific craft problems.
- 16. 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 up to forty (40) copies of necessary training manuals, handouts, visual aids, and reference materials at least one week prior to each training session. Specific quantities will be identified during progress or other meetings.

# 2.04 FORMAT AND CONTENT

- A. Each training session shall be comprised of time spent both in the classroom and at the specific location of the subject equipment or system.
- B. Instructors shall apply adult education best practices, emphasizing learner participation and activity.
- C. Training delivery may include problem solving, question/answer, hands-on instruction, practice, evaluation/feedback tools, and lecture.
- D. Visual aids must support training objectives.
- E. Delivery time should be less than 30 percent of class time.
- F. Delivery time is a minimum of 1 hours and a maximum of 2 hours.
- G. Longer training sessions requires Owner approval.
- H. Refreshment and breaks within the Owner's customary schedule or as predetermined in advance of the training delivery.

01664 – 3 of 9 Revised 06/03/21
- I. Estimated maximum class size will vary for class and field training sessions. This will be determined in advanced. Commissioning Manager and Owner will develop a headcount one (1) week prior to the class so the instructor can provide the correct number of aids and know the correct number of repeated sessions.
- J. Training Modules:
  - 1. Provide a training module for each equipment category.
  - 2. Divide each training module's instructional content into discrete lesson plans with a division between operations and maintenance training if directed by the Owner's Representative.
- K. Training Aids:
  - 1. Instructors are to utilize P&ID's and are encouraged to use audio-visual devices, models, charts, etc. to increase the transfer of knowledge.
  - 2. Instructors shall provide such equipment (televisions, video recorder/player, computer, projectors, screens, easels, etc.), models, charts, etc. for each class.
  - 3. Instructor is responsible for confirming with Engineer and Owner in advance of each class that the classroom will be appropriate for the types of audiovisual equipment to be utilized.
- L. Familiarization:
  - 1. Review catalog, parts lists, drawings, etc. which have been previously provided for the plan files and operation and maintenance manuals.
  - 2. Check out the installation of the specific equipment items.
  - 3. Demonstrate the unit and indicate how all parts of the specifications are met.
  - 4. Answer questions.
- M. Safety:
  - 1. Using material previously provided, review safety references.
  - 2. Discuss proper precautions around equipment.
- N. Operation:
  - 1. Using material previously provided, review reference literature.
  - 2. Explain all models of operation (including emergency).
  - 3. Check out Owner's personnel on proper use of the equipment.
- O. Preventive Maintenance:
  - 1. Using material previously provided, review preventative maintenance (PM) lists including:
    - a. Reference material.
    - b. Daily, weekly, monthly, quarterly, semiannual, and annual jobs.
  - 2. Demonstrate procedures to perform PM jobs.
  - 3. Show Owner's personnel what to look for as indicators of equipment problems.
  - 4. Facilitate discussion with Owner's personnel as to which PMs to continue after the warranty period.
- P. Corrective Maintenance:
  - 1. List potential problems including troubleshooting recovery from adverse operating conditions.
  - 2. Identify, describe, instruct and provide via the transmittal process any special tools required for maintenance.
  - 3. Describe Recommended measuring instruments and procedures and provide instruction on interpreting alignment measurements as appropriate.
  - 4. Describe recommended procedures to check/test equipment following a corrective maintenance (CM) repair.
  - 5. Open equipment and demonstrate procedures, where practical.

01664 – 4 of 9 Revised 06/03/21

- Q. Parts:
  - 1. Show how to use previously provided parts list and properly identify parts to be ordered.
  - 2. Define and check spare parts on hand and identify minimum inventory levels.
- R. Local Representatives:
  - 1. Where to order parts: Name, address, telephone.
  - 2. Service problems:
    - a. Who to call.
    - b. How to get emergency help.
- S. Original Equipment Manufacturer (OEM) Operation and Maintenance (O&M) Manuals:
  - 1. Review any other material submitted.
  - 2. Update material as required.

## 2.05 VIDEO RECORDING

- A. The Contractor shall retain the services of a commercial videotaping service to record each training session. If trainer is required to read a script during videotaping, the trainer will have one video recorded session without personnel and the remaining sessions with personnel will be untaped. After taping, the material may be edited and supplemented with professionally produced graphics to provide a permanent record. The Contractor shall advise all manufacturers providing training sessions that the material may be videotaped and shall make available to the Owner's videotaping contractor such utility services and accommodations as may be required to facilitate the production of the video tape record. Video recording shall be integrated into electronic O&M by the Design-Builder or Contractor.
- B. Include classroom and field instruction with question and answering periods.
- C. Owner approval required for producer of video materials.
- D. Digital recording shall become the property of the Owner.
- E. Audio quality should not degrade during the recording of the field sessions due to background noise, space, distance, or other factors. Trainer will verify that audio quality after the first training session.
- F. Trainer shall record the first training session and verify it presents accurately.
- G. Video files shall be a file format and delivery medium as directed and approved by Owner.
- H. Electronic copies of the other training material shall be tagged per Owner Standards to be provided by the Owner by the Contractor or Design-Builder
- I. Provide 2 complete sets of video materials fully indexed and catalogued with printed labels sating session content and dates recorded or an indexed video file to each segment of the training.
- J. Contractor shall provide a written release from all claims to the recorded training material produced.

# 2.06 ATTENDANCE

- A. Trainer shall keep an attendance log of all attendees.
- B. Trainer shall have the trainees each sign an attendance form at the beginning and end of the training session.
- C. These records shall be provided to the appropriate Division Manager in which the training is being provided.

01664 – 5 of 9 Revised 06/03/21

## 2.07 TRAINING SCHEDULE

- A. Draft Training Schedule for the entire project shall be submitted after the first item requiring training arriving on the site. When approved, the training schedule shall be integrated into the project schedule.
- B. List specified equipment and systems that require training services and show:
  - 1. Respective manufacturer
  - 2. Estimated dates for installation completion
  - 3. Estimated training dates
- C. Training is a prerequisite for putting equipment into operation. Staged or partial training may be approved by the Owner's Representative.
- D. Allow for separate training sessions for maintenance staff and operations staff. Owner will notify the trainer if it is desired to have separate sessions for maintenance and operations staff or have combined sessions.
- E. Allow for multiple session for Operations training:
  - 1. Provide a minimum of three training sessions to accommodate different shifts. One will be for each shift: day, evening, and night on at least two days, or as determined appropriate to meet the Owner's requirements.
  - 2. Adjust schedule to ensure training of appropriate personnel as deemed necessary by Owner, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment,
  - 3. Coordinate with section 01320 "Construction Progress Documentation," and Section 01757, "Commissioning."
- F. Contractor shall provide a draft training schedule 30 days after the notice to proceed.
- G. Schedule Owner's staff training within the constraints of their workloads. Those who will participate in this training have existing full-time work assignments, and training is an additional assigned work task, therefore, scheduling is imperative. Owner staff work schedules are variable for operations staff, as treatment facilities are typically operated on an around- the-clock basis.
- H. Training sessions will be finalized two weeks prior to the training.
- I. Training sessions that are rescheduled after a finalized date will be rescheduled at least two weeks out.
- J. Commissioning Manager is responsible for preparing agendas and meeting minutes.

# PART 3 – EXECUTION

## 3.01 TRAINING

- A. Training shall be conducted in conjunction with the operational testing and commissioning periods. Classes shall be scheduled such that classroom sessions are interspersed with the instruction in logical sequence. The Contractor shall arrange to have the training conducted on consecutive days if approved by the Owner's Representative. Concurrent classes shall not be allowed.
- B. Instructors shall apply adult education best practices, emphasizing learner participation and activity.
- C. Unless otherwise agreed by the Owner, classes shall be repeated twice for a morning session, afternoon session, and a night session in order to have all three operations shifts trained. Adjust training schedule to ensure training of appropriate personnel deemed necessary by Owner, and to

01664 – 6 of 9 Revised 06/03/21

allow full participation by manufactures' representatives. Adjust schedule for interruptions in operability of equipment. Coordinate training efforts with Section 01320 Construction Progress Documentation and Section 01757 Commissioning.

- D. Approved operation and maintenance manuals for the special equipment shall be provided to the Owner prior to the start of the training. Videotaping shall take place concurrently with the training sessions.
- E. Pre-startup Training shall be coordinated with Owner's operating personnel and Manufacturers' representatives, and with submission of Operation and Maintenance manuals in accordance with Section 01783 Operation and Maintenance Data. Pre-startup Training shall be completed at least 14 calendar days prior to beginning of system startup.
- F. Post-startup Training, if required in specifications, shall be furnished and coordinated with Owner's operating personnel by the respective manufacturers' representatives.
- G. Trainees will keep training materials and documentation after the session.
- H. Operations and maintenance manuals as specified in technical sections:
  - 1. Provide a minimum of 2 copies of final Engineer-approved operations and maintenance manuals as specified in Section 01783 O&M Manuals for use during the classroom instruction.
  - 2. Owner reserves the right to delay training for a particular equipment item if the operations and maintenance manuals for that equipment are incomplete, inaccurate, or otherwise not in a format or stage of development for use by the Owner's staff.
  - 3. No contract extensions or extra costs will be allowed for training delays due to operations and maintenance manual submittal delays.
- I. Provide Supplemental documentation handouts to support instruction.
- J. The following services shall be provided for each item of equipment or system. Additional services shall be provided when specifically required in individual specification sections.
  - 1. As a minimum, classroom training for operations personnel will include:
    - a. Use of electronic media and drawings.
    - b. Discussion of the equipment's specific location in the plant and operational overview.
    - c. Purpose and plant function of the equipment.
    - d. A working knowledge of the operating theory of the equipment.
    - e. Start-up, shutdown, normal operation, emergency operating procedures, including discussion on system integration and electrical interlocks, if any.
    - f. Identify and discuss safety items and procedures.
    - g. Routine preventive maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.
    - h. Operator detection, without test instruments, of specific trouble symptoms.
    - i. Required equipment exercise procedures and intervals.
    - j. Routine disassembly and assembly of equipment if applicable (as judged by the Owner on a case-by-case basis) for purposes such as operator inspection of equipment.
  - 2. As a minimum, hands-on equipment training for operations personnel will include:
    - a. Identify location of equipment and review the purpose.
    - b. Identifying piping and flow options.
    - c. Identifying valves and their purpose.

01664 – 7 of 9 Revised 06/03/21

- d. Identifying instrumentation:
  - (1) Location of primary element.
  - (2) Location of instrument readout.
  - (3) Discuss purpose, basic operation, and information interpretation.
- e. Discuss, demonstrate, and perform standard operating procedures and round checks.
- f. Discuss and perform the preventive maintenance activities.
- g. Discuss and perform startup and shutdown procedures including alternative strategies.
- h. Perform the required equipment exercise procedures.
- i. Perform routine disassembly and assembly of equipment if applicable.
- j. Identify and review safety items and perform safety procedures, if feasible.
- 3. Classroom equipment training for the maintenance and repair personnel will include:
  - a. Theory of operation.
  - b. Description and function of equipment.
  - c. Startup and shutdown procedures.
  - d. Normal and major repair procedures.
  - e. Equipment inspection and troubleshooting procedures including the use of applicable instruments and the "pass" and "no pass" instrument readings.
  - f. Routine and long-term calibration procedures.
  - g. Safety procedures.
  - h. Preventive maintenance such as lubrication, normal maintenance such as belts, seals, and bearing replacement; and up to major repairs such as replacement of major equipment part (s) with the use of special tools, bridge cranes, welding jigs, etc.
- 4. Hands-on Equipment training for maintenance and repair personnel shall include:
  - a. Locate and identify equipment components.
  - b. Review the equipment function and theory of operation.
  - c. Review normal repair procedures including corrective maintenance.
  - d. Perform startup and shutdown procedures.
  - e. Review and perform safety procedures.
  - f. Perform Owner approved practice maintenance and repair job(s), including mechanical and electrical adjustments, calibration, and troubleshooting equipment problems.
- 5. Distribute Training Evaluation Form following each training session.
  - a. Training Evaluation Form is included in Section 01757 –Commissioning.
  - b. Return completed Training Evaluation Forms to Owner's designated training coordinator immediately after session is completed.
  - c. Revise training sessions judged "Unsatisfactory" by a majority of attendees.
  - d. Conduct training sessions again until a satisfactory rating is achieved at no additional cost to Owner.
- 6. Post Training Session
  - a. Training Course Material: Due 14 days after class completion.
  - b. Video Recording tagged and other materials tagged.
  - c. Class Attendance Sheet and trainee acknowledgment that they were trained and able to run the equipment.

01664 – 8 of 9 Revised 06/03/21

- d. Training Agenda, Lesson Plan, presentation, handouts
- e. Other audio-visual aids utilized during each training course.
- f. Provide material for all sessions of the class in a single transmittal.
- g. Format: 2 electronic copies and 3 hard copies organized in notebooks.

# K. Closeout Documentation

- 1. Provide Training Documentation including submission to MDNR for operator training credit. Trainer will be required to submit any additional information required by MDNR.
- 2. Provide training certification and records of training acceptance by MDNR.

# END OF SECTION

# 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 his 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. Section 01000 General Project Requirements.
- B. Section 01015 Specific Project Requirements.
- C. Section 01300 Submittals.
- D. Section 01581 Public Communications.

#### 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" (<u>http://kcmo.gov/) (</u>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.

01700 - 1 of 8 Revised 05-08-20

- 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 Plan(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 plans(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.

01700 – 2 of 8 Revised 05-08-20

#### 1.09 RESPONSIBILITY

- A. The Contractor shall designate a Traffic Control Supervisor having the responsibilities defined in paragraph DEFINTIONS.
- 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 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.

01700 - 3 of 8 Revised 05-08-20

- 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 (<u>https://www.kcmo.gov/city-hall/departments/city-planning-development/other-city-plans</u>) 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.

## 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 web site at <u>http://kcmo.gov/</u>.
- 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

## 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 not 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.

01700 - 6 of 8 Revised 05-08-20

## 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 follow text:



or

EMERGENCY NO
PARKING
7:00 A.M. to
6:00 P.M.

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.

01700 - 7 of 8 Revised 05-08-20

- F. The signs are to be installed at the beginning and end of each block and at a maximum of 150-feet 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 soon 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 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 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 01757 - COMMISSIONING

## PART 1 – GENERAL

#### 1.01 SUMMARY

A. This Section includes the requirements for each Commissioning phase of, the Project equipment/system and/or facility.

## **1.02 DEFINITIONS**

- A. Commissioning The process of planning, testing, and process start-up of the installation for compliance with contract requirements and demonstrating, through documented verification, that the project has successfully met the Contractual requirements. It includes training the Owner's staff to operate the facility.
- B. Commissioning Phases The work activities of facility commissioning are grouped into the phases defined in the table below.

	Commissioning	
<u>Planning</u> <u>Phase</u>	<u>Testing and</u> <u>Training</u> <u>Phase</u>	<u>Process</u> <u>Start-Up</u> <u>Phase</u>
Owner Training Plan and Schedule	Source Testing	Process Start-up
Commissioning Schedule	Owner Training	Process Operational Period
Subsystem Testing Plan	Installation Testing	Instrumentation and Controls Fine-Tuning
	Functional Testing	
	Closeout Documentation	

- C. Component A basic building block of equipment, subsystems, and systems that requires installation or functional testing but does not have electrical connection or internal electronics. (Examples: filter effluent piping and manual isolation valves).
- D. Device A basic building block of equipment, subsystems, and systems that requires installation or functional testing and does have electrical connections or internal electronics. (Examples: filter level transmitter or water pump pressure transmitter).
- E. Equipment An assembly of component(s) and devices(s) that requires installation or functional testing. (Examples: Pump, motor, VFD, Ozone Generator, UV Disinfection System, etc.).
- F. Facility A grouping of process areas, systems, subsystems, equipment, components, and devices (Examples: treatment plant, pump station, etc.).
- G. Functional Testing Testing performed on a completed subsystem to demonstrate that equipment/system meets manufacturers' calibration and adjustment requirements and other requirements as specified. Functional testing includes operating equipment/system manually in local, manually in remote (or remote manual), and automatically in remote (in remote auto).

01757 – 1 of 17 Revised 06/03/21

- H. Installation Testing Testing to demonstrate that subsystem component (piping, power, networks, devices, etc.) is ready and meets the project requirements in advance of functional testing. Installation testing also includes manufacturers' certification of installation and other requirements as specified to prepare equipment/system for Functional Testing. Also referred to as Field Acceptance Testing.
- I. Instrumentation and Controls Fine-Tuning Improving the performance of the Instrumentation Process Control system by operating for an extended time period.
- J. Manufacturer's Certificate of Source Testing When applicable, the form is used during Source Testing for the manufacturer to confirm that the applicable source tests have been performed and results conform to the Contract Documents. The form is provided at the end of this Section.
- K. Manufacturer's Certificate of Installation and Functionality Compliance The form is used during Installation Testing and Functional Testing. It is submitted at the end of Functional Testing to confirm that the equipment/system is installed in conformance with the Contract Documents and that it meets the Functional Testing requirements defined in the Contract Documents. The form is provided at the end of this Section.
- L. Process Area A grouping of systems, subsystems, equipment, components, and devices that divide a facility into functional areas. (Examples: Filter Process Area or Chemical Area).
- M. Process Operational Period A period of time after completion of the process start-up set aside for final Operational Testing to verify facility performance meets the Contract Document requirements. This period may specifically limit other construction activities.
- N. Process Start-up Phase Operating the facility to verify performance meets the Contract Document requirements.
- O. Process Start-Up Activities conducted after the testing and training phase that are necessary to place systems or process areas into operational service.
- P. Product A system, subsystem or component.
- Q. Subsystem A building block of systems made up from a grouping of components, devices, and equipment that perform a definable function. (Examples: Filter No. 1 Backwash Subsystem, Sedimentation Basin No. 1 Hoseless Sludge Removal Subsystem).
- R. System A grouping of subsystems, equipment, components, and devices that perform a definable function. (Examples: Filter No. 1, Sedimentation Basin).

## 1.03 COMMISSIONING MANAGER

- A. Designate and provide a COMMISSIONING MANAGER for this project.
- B. Submit summary of the COMMISSIONING MANAGER's qualifications within 30 days of NTP:
  - 1. Include description of previous experience as a COMMISSIONING MANAGER on similar projects for the designated COMMISSIONING MANAGER with a list of references including phone numbers for review and Owner approval.
- C. COMMISSIONING MANAGER responsibilities include the following:
  - 1. Lead efforts relating to Commissioning.
  - 2. Be thoroughly familiar with commissioning requirements in the Contract Documents.
  - 3. Be regularly engaged and experienced in all aspects of commissioning.
  - 4. Provide technical instruction for commissioning.
  - 5. Provide primary interface with Engineer and Owner for efforts relating to Commissioning of Project facilities.
  - 6. Coordinate training efforts.
- D. COMMISSIONING MANAGER on-site:
  - 1. Testing and Training Phase: Full-time.
  - 2. Process Start-up Phase: Full-time.
- E. Designate and provide COMMISSIONING MANAGER assistants, as needed.

01757 – 2 of 17

Revised 06/03/21

# 1.04 SERVICES OF MANUFACTUERER'S REPRESENTATIVES

- A. Qualification of manufacturer's representative as specified in the Contract Documents technical sections include the following:
  - 1. Authorized representative of the manufacturer, factory trained and experienced in the technical applications, installation, operation, and maintenance of respective equipment/system with full authority by the equipment/system manufacturer to issue the certifications required of the manufacturer.
  - 2. Competent, experienced technical representative of equipment/system manufacturer for assembly, installation, testing guidance, and training.
  - 3. Additional qualifications may be specified in the individual sections.
  - 4. Submit qualifications of the manufacturer's representative no later than 30 days in advance of required observations.
  - 5. Representative subject to approval by Owner and Engineer.
  - 6. No substitute representatives will be allowed until written approval by Owner and Engineer has been obtained.
- B. Completion of manufacturer on-site services: Engineer approval required.
- C. Manufacturer is responsible for determining the time required to perform the specified services.
  - 1. Minimum times specified in the Contract Documents are estimates.
  - 2. No additional costs associated with performing the required services will be approved.
  - 3. Manufacturer required to schedule services in accordance with the Contractor's project schedule up to and including making multiple trips to project site when there are separate milestones associated with installation of each occurrence of manufacturer's equipment.
- D. Manufacturer's on-site services as specified in the Contract Documents include the following:
  - 1. Assistance during Commissioning Phase and Process Start-Up Phase.
  - 2. Provide daily copies of manufacturer's representatives field notes and data to Engineer.
  - 3. Services as specified in Section 01433 Manufacturer's Field Services.
  - 4. Other requirements as specified in the Contract Documents.

## 1.05 PLANNING PHASE

- A. Overview of Planning Phase:
  - 1. Define approach and timing for Commissioning.
- B. Owner training plan and schedule:
  - 1. Complete as specified in Section 01664.
- C. Commissioning Schedule:
  - 1. Commissioning overview:
    - a. Comply with Commissioning Roles and Responsibilities Matrix specified at the end of this Section.
  - 2. Submittal due date:
    - a. Submit Commissioning Schedule not less than 60 calendar days prior to planned initial commissioning of each subsystem or system.
  - 3. Schedule requirements:
    - a. Schedule durations and float for commissioning activities to ensure Work does not fall behind schedule due to complications or delays during commissioning.
    - b. Time-scaled network diagram detailing the work to take place in the period between 90 calendar days prior to planned initial commissioning of equipment and systems, and prior to the date of Substantial Completion, together with supporting narrative.

01757 – 3 of 17 Revised 06/03/21

- c. Provide detailed schedule of commissioning activities including durations and sequencing requirements.
  - (1) Identify the following activities:
    - (a) Testing and Training Phase:
      - (i) Source Testing.
      - (ii) Owner Training.
      - (iii) Installation Testing.
      - (iv) Functional Testing.
      - (v) Clean Water Facility Testing.
      - (vi) Closeout Documentation.
    - (b) Process Start-Up Phase:
      - (i) Process Start-Up.
      - (ii) Process Operational Period.
      - (iii) Instrumentation and Controls Fine-Tuning.
- d. Schedule manufacturer's services to avoid conflict with other on-site testing or other manufacturers' on-site services.
- e. Verify that conditions necessary to allow successful testing have been met before scheduling services.
- D. Subsystem testing plans:
  - 1. Provide separate testing plans for each individual subsystem and system that include the following:
    - a. Approach to testing including procedures, schedule, and recirculation requirements.
    - b. Test objective: Demonstrate subsystem meets the design requirements as specified in the technical sections.
    - c. Test descriptions, forms, temporary systems (pumps, piping, etc.), shutdown requirements for existing systems, test forms, test logs, witness forms, and checklists to be used to control and document the required tests.
    - d. Test forms: Include, but not limited to, the following information:
      - (1) Tag and name of equipment/system to be tested.
      - (2) Test date.
      - (3) Names of persons conducting the test.
      - (4) Names of persons witnessing the test, where applicable.
      - (5) Test data.
      - (6) Applicable project requirements.
      - (7) Check offs for each completed test or test step.
      - (8) Place for signature of person conducting tests and for the witnessing person, as applicable.
    - e. Define start-up sequencing of unit processes:
      - (1) Include testing of alarms, interlocks, permissives, control circuits, capacities, speeds, flows, pressures, vibrations, sound levels, and other parameters.
      - (2) Provide detailed test procedures setting forth step-by-step descriptions of the procedures for systematic testing of equipment/system.
      - (3) Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration.
        - (a) Perform initial checks in the presence of and with the assistance of the manufacturer's representative.

01757 – 4 of 17 Revised 06/03/21

- (4) Demonstrate proper operation of each control loop function including mechanical, electrical, alarms, local and remote controls, instrumentation, and other equipment/system functions.
  - (a) Generate signals with test equipment/system to simulate operating conditions in each control mode.
- 2. Engineer approval of test plan is required prior to performing test.
  - a. Revise and update test plans based on review comments, actual progress, or to accommodate changes in the sequence of activities.
  - b. Submit test reports for each phase of testing for each equipment/system.
  - c. Engineer approval of preceding test reports is required prior to start of next test.
  - d. Tests will be rescheduled if test plan is not approved by the required deadline.(1) Contractor is responsible for any resulting delay.
- 3. Contractor is responsible to reproduce and distribute final test procedures.
  - a. Provide 3 copies for Engineer.
- 4. Tests may commence only after Engineer has received approved test plan copies.
- 5. Submittals:
  - a. Submit test plans not less than 90 calendar days prior to planned installation testing of subsystem or system.
  - b. Completed Manufacturer's Certificate of Installation and Functionality Compliance.
  - c. Test procedures and forms: Provide signed-off copy of test forms and test reports upon completion of the test.
  - d. Test reports:
    - (1) Submit preliminary copies within 1 day after testing completion.
    - (2) Submit final copies and report within 14 days after testing completion.

#### 1.06 TESTING AND TRAINING PHASE

- A. Overview of Testing and Training Phase:
  - 1. General:
    - a. Include specified Source Testing, Owner Training, Installation Testing, Functional Testing, Clean Water Facility Testing, and Closeout Documentation required by this Section and the technical sections.
  - 2. Contractor responsibilities:
    - a. Furnish labor, power, chemicals, tools, equipment, instruments, and services required for and incidental to completing commissioning activities in accordance with the approved Commissioning Plans.
    - b. Prior to testing, verify equipment protective devices and safety devices have been installed, calibrated, and tested.
    - c. Acceptable tests: Demonstrate the equipment/system performance meets the requirements stated in the Contract Documents.
      - (1) When the equipment/system fails to meet the specified requirements, perform additional, more detailed, testing to determine the cause, correct, repair, or replace the causative components and repeat the testing that revealed the deficiency.

#### B. Source testing:

- 1. Also referred to as factory testing or factory acceptance testing (FAT).
- 2. Test components, devices, and equipment/system for proper performance at point of manufacture or assembly as specified in the technical sections.
- 3. Notify the Engineer in writing when the equipment/system is ready for source inspection and testing.
- 4. Source Test Plan:
  - a. As specified in this Section and other technical sections.
  - b. Source testing requirements as specified in technical sections.
    - (1) Non-witnessed: Provide Manufacturer's Certificate of Source Testing.
    - (2) Witnessed: 1 Owner's representative and 1 Engineer's representative present during testing, unless otherwise specified, and provide Manufacturer's Certificate of Source Testing.
  - c. Prepared by Contractor as a result of discussions and planning emerging from regularly conducted commissioning meetings for source tests as specified in the Contract Documents.
  - d. Provide the following items for each Source Test:
    - (1) Purpose and goals of the test.
    - (2) Identification of each item of equipment/system, including system designation, location, tag number, control loop identifier, etc.
    - (3) Description of the pass/fail criteria that will be used.
    - (4) Listing of pertinent reference documents (Contract Documents and industry standards or sections applicable to the testing).
    - (5) Complete description, including drawings or photographs, of test stands and/or test apparatus.
    - (6) Credentials of test personnel.
    - (7) Descriptions of test equipment to be used, product information, and all appropriate calibration records for the test equipment.
    - (8) Test set-up procedures.
    - (9) Detailed step-by-step test procedures.
      - (a) The level of detail shall be sufficient for any witness with a rudimentary technical aptitude to be able to follow the steps and develop confidence that the tests were being performed as planned.
      - (b) All steps are significant, and all steps shall be included in the procedures.
    - (10) Sample data logs and data recording forms.
    - (11) Sample computations or analyses with the results in the same format as the final report to demonstrate how data collected will be used to generate final results.
      - (a) Complete disclosure of the calculation methodologies.
      - (b) Include a sample for each type of computation required for the test and analysis of the results.
    - (12) Detailed outline of the Source Test report.
    - (13) Sample test reports.
  - e. Submit Source Test Plan and forms as specified in the technical sections.
    - (1) Submit a copy of the Source Test Plan at least 21 days before any scheduled test date.
    - (2) Engineer approval of Source Test Plan required prior to beginning source testing.
    - (3) Schedule the testing after approval of the test procedures submittal.

01757 – 6 of 17 Revised 06/03/21

- f. Indicate the desired dates for source inspection and testing.
  - (1) Notify the Engineer of the scheduled tests a minimum of 15 days before the date of the test.
- 5. Test results:
  - a. Prepare and submit test results with collected data attached.
- 6. Owner is responsible for costs associated with Owner's representatives and Engineer's representative witnessing initial Source Tests.
  - a. If Source Test is not ready when the witnesses arrive or if the Source Test fails, the witnesses will return home with Contractor responsible for costs associated with the trip including costs described below. Contractor is responsible for rescheduling the Source Test and witnesses' costs associated with the second trip including costs described below.
    - (1) On-site time: 1 day at the site plus travel time each direction, unless specified otherwise.
    - (2) Transportation costs:
      - (a) Travel 1 day on commercial airline to site including air flight costs.
      - (b) Travel 1 day on commercial airline from site including air flight costs.
      - (c) Mid-size rental car or taxi services from hotel to and from the test site plus fuel, tolls, and airport parking at the departing airport.
      - (d) International travel: Per-diem rates as established by the US Department of State for the specific location and dates of travel. Travel expenses may include the direct cost of securing passports, visas, language interpreters, document translators, communications, and internet access.
    - (3) Hotel costs at a facility with an American Automobile Association 3 diamond rating or better for single occupancy room per person per day.
    - (4) Meal allowance of \$61 per person per day.
    - (5) On-site time: 1 day at the site, unless specified otherwise.
    - (6) Only actual costs will be documented and billed.
  - b. Fees incurred such as airline reservation change fees, loss of fare due to purchase of nonrefundable tickets, hotel cancellation/rebooking fees, and similar expenses incurred as a result of OSS-requested changes to the inspection schedule after the initial notification shall be borne by the Contractor.
  - c. Contractor is responsible for witnesses' costs associated with retests including costs described above.
- 7. Contractor is responsible for providing fuel, chemicals, and other consumables needed for Source Testing.
- C. Owner training:
  - 1. Provide training as specified in Section 01664.
- D. Installation Testing:
  - 1. Perform subsystem testing according to approved Subsystem Testing Plans.
  - 2. Initiate the Manufacturer's Certificate of Proper Installation for all equipment.
    - a. Manufacturer's Certificate of Proper Installation form is included in this Section.
    - b. Manufacturer's Certificate of Proper Installation certifies the equipment meets the following requirements:
      - (1) Has been properly installed, adjusted, aligned, and lubricated.
      - (2) Is free of any stresses imposed by connecting piping or anchor bolts.

01757 – 7 of 17 Revised 06/03/21

- (3) Is able to be operated as necessary for Functional Testing.
- c. Form shall be submitted after completion of Functional Testing, as specified in this Section.
- 3. Coordinate Installation Testing with restrictions and requirements as specified in Section 01140 Work Restrictions.
- 4. Perform coating holiday testing as specified in Section 09960 High- Performance Coatings.
- 5. Perform pressure and leakage testing as specified in individual component Sections.
- 6. Perform mechanical equipment Installation Testing: As in individual equipment sections.
  - a. Remove rust preventatives and oils applied to protect equipment during construction.
  - b. Flush lubrication systems and dispose of flushing oils.
    - (1) Recharge lubrication system with lubricant recommended by manufacturer.
  - c. Flush fuel system and provide fuel for testing and start-up.
  - d. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace defective seals.
  - e. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
  - f. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
  - g. Perform cold alignment and hot alignment to manufacturer's tolerances.
  - h. Adjust V-belt tension and variable pitch sheaves.
  - i. Inspect hand and motorized valves for proper adjustment.
    - (1) Tighten packing glands to ensure no leakage but permit valve stems to rotate without galling.
    - (2) Verify valve seats are positioned for proper flow direction.
  - j. Tighten leaking flanges or replace flange gasket.
    - (1) Inspect screwed joints for leakage.
  - k. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to operational testing.
- 7. Electrical devices and subsystems Installation Testing: As specified in Section 16950 Electrical System Testing and Settings, and the technical sections.
- 8. Instrumentation devices and subsystems Installation Testing
- 9. Heating, ventilating, and air conditioning systems Installation Testing:
  - a. Perform testing of heating, ventilating, and air conditioning equipment, balancing of distribution systems, and adjusting of ductwork accessories.
  - b. Test hydronic systems, if required by technical sections.
- E. Functional Testing:
  - 1. Perform subsystem testing according to approved Subsystem Testing Plan.
  - 2. Notify the Engineer 5 days prior to when the Work is ready for Functional Testing.
    - a. Perform testing in the presence of the Engineer.
  - 3. Determine Functional Testing durations with Owner's input.
    - a. Durations will vary depending on the availability of water for testing.
    - b. Target minimum Functional Test duration: 8 hours.
      - (1) Identify equipment/system that cannot be tested for a minimum of 8 hours as specified in technical sections.
  - 4. Perform Functional Testing as specified in technical sections.
    - a. Perform Functional Testing in addition to the other tests specified in the technical sections.
    - b. Perform Functional Testing to demonstrate that the component equipment functions as an entire system in accordance with the design requirements.

01757 – 8 of 17 Revised 06/03/21

- c. Perform Functional Testing to demonstrate that the unit process has operated in a manner necessary to demonstrate equipment/system functions manually in local, manually in remote (or remote manual), and automatically in remote (in remote auto).
- d. Perform testing with Contractor-provided water.
- e. Repair or replace parts that operate improperly and retest.
- f. Submit testing results as specified in the technical sections to the Owner and Engineer for approval of Functional Testing results.
- 5. Provide completed Manufacturer's Certificate of Installation and Functionality Compliance forms for all equipment.
  - a. Manufacturer's Certificate of Installation and Functionality Compliance form is included in this Section.
  - b. Manufacturer's Certificate of Installation and Functionality Compliance certifies the equipment/system meets the following requirements:
    - (1) Is suitable for satisfactory full-time operation under full-load conditions.
    - (2) Operates within the allowable limits for vibration and noise.
    - (3) Electrical and instrumentation requirements:
      - (a) Electrical equipment, instrumentation, and control panels are properly installed, calibrated, and functioning.
      - (b) Electrical Installation Testing is complete, and test results have been approved by the Engineer.
        - (i) Noted deficiencies have been corrected.
        - (ii) Relays, circuit breakers, and other protective devices are set.
      - (c) Control logic for start-up, shutdown, sequencing, interlocks, control, and emergency shutdown has been tested and is properly functioning.
      - (d) Motor control is calibrated and tested.

## F. Closeout documentation:

01757 – 9 of 17

- 1. Submittals:
  - a. Provide records generated during Commissioning Phase of Project.
    - (1) Required documents include but are not limited to:
      - (a) Training documentation.
      - (b) Manufacturer's Certificate of Source Testing.
      - (c) Manufacturer's Certificate of Installation and Functionality Compliance.
      - (d) Daily logs of equipment/system testing identifying tests conducted and outcome.
      - (e) Test forms and documentation.
      - (f) Functional Testing results.
      - (g) Logs of time spent by manufacturer's representatives performing services on the job site.
      - (h) Equipment lubrication records.
      - (i) Electrical phase, voltage, and amperage measurements.
      - (i) Insulation resistance measurements.
      - (k) Bearing temperature measurements.
    - (2) Data sheets of control loop testing including testing and calibration of instrumentation devices and setpoints. Format: 2 electronic copies and 3 hard copies organized in notebooks.
    - (3) Due date: Within 14 calendar days of Substantial Completion.

Revised 06/03/21

#### 1.07 PROCESS START-UP PHASE

A. Overview of Process Start-Up Phase:

- 1. Operating the facility to verify performance meets the Contract Document requirements.
- B. Process Start-Up:
  - 1. Perform process start-up in the presence of the Engineer.
  - 2. Pre-start-up activities:
    - a. Commissioning Documentation and Data Review.
    - b. Start-Up Go/No-Go Decision Criteria.
    - c. Building and Fire Inspection Compliance Check.
    - d. Process Start-Up Sequence Review.
      - (1) Submit a Process Start-Up plan for review by Engineer not less than 90 calendar days prior to planned commencement of process start- up activities.
      - (2) Include the following:
        - (a) Pre-start-up activities.
        - (b) Process Start-Up.
        - (c) Process Operational Period.
    - e. Description of Temporary Testing Arrangement, if applicable.
    - f. Final Process Start-Up Forms and Documentations.
    - g. Final Operational Testing Plan.
  - 3. Control loop tuning.
    - a. Perform control loop tuning during system testing with water to the extent possible.
  - 4. Process area start-ups.
    - a. Process start-up individual process areas comprised of multiple interdependent systems where possible and beneficial to reduce complexity and risk of complete facility testing.
    - b. Process area test flows may be limited by upstream and downstream process constraints (i.e., tank and basin volumes) and/or localized recirculation capabilities.
  - 5. Facility-wide process start-up.
    - a. Upon approved completion of pre-start-up activities, perform entire facility process start-up.
      - (1) Complete control loop tuning during this phase of process start-up.
      - (2) Continue process start-up operations until facility meets or exceeds the Contract requirements.
    - b. Process control systems testing:
      - (1) Test complete system instrumentation, controls and PLC, HMI, and LOI programming for the facility.
    - c. HVAC systems start-up and testing:
      - (1) Test complete HVAC system for the facility.
    - d. Ancillary systems start-up and testing:
      - (1) Test complete security system, phone system, fire alarm system, etc. for the facility.
    - e. Remaining equipment/system tests:
      - (1) Conduct remaining specified equipment/system performance tests that could not be performed during the Testing and Training Phase due to inter-system and/or treatment process dependencies.

01757 – 10 of 17 Revised 06/03/21

- C. Process Operational Period:
  - 1. Prior to beginning the Process Operational Period:
    - a. Conformance with treatment standards is required prior to Operational Testing, if applicable.
      - (1) Biological processes require time to build up the necessary population of organisms to meet treatment standards, as specified in Section 01140 Work Restrictions.
    - b. Correct any outstanding punch list items prior to the Operational Testing.
  - 2. Duration: 30 calendar days.
  - 3. Engineer will be present for process operational period unless such presence is expressly waived in writing.
  - 4. Prove facility conformance with Contract Document requirements.
  - 5. Contractor to provide:
    - a. Specified start-up materials and operating supplies.
    - b. Necessary craft of labor assistance, in the event of an emergency equipment failure requiring immediate attention (emergency is defined as a failure of function which precludes the further operation of a critical segment of or the whole of the Work) with a response time of not more than 4 hours from the time of notification.
    - c. Manufacturer's authorized representative to supervise placing equipment/systems in operation and provide guidance during Operational Testing per applicable section.
    - d. Necessary manufacturer's representatives and operating supplies for retesting systems that fail to pass the initial Operational Testing due to deficiencies in products of workmanship at no additional cost to the Owner.
    - e. List of 24-hour "on-call" representative supervisory persons who will monitor the Operational Testing and serve as liaison for the Engineer and Owner.
  - 6. Owner will provide:
    - a. Operations personnel for duration of test.
  - 7. Prior to date of Substantial Completion of Installation, the Contractor's COMMISSIONING MANAGER shall oversee Process Operational Period.
    - a. Owner staff will operate the completed Project construction.
    - b. Entire system shall continuously meet performance requirements and shall operate without fault, failure, or defect for a continuous period.
    - c. Individual equipment/system failures that are corrected within 24 hours and do not prevent the entire project from continuously satisfying the established operational requirements shall not require the consecutive day test to be restarted unless the failure recurs.
    - d. Restart the consecutive test period for any of the following conditions:
      - (1) Any failure of the complete Project construction to meet operational requirements.
      - (2) When malfunctions or deficiencies cause shutdown or partial operation of the facility, or results in failure of the complete Project construction to meet operational requirements.
      - (3) Any individual equipment/system failure that meets any of the following conditions:(a) Requires more than 24 hours to correct.
        - (b) Recurs within the 24-hour correction period requiring further correction.
      - (4) Immediately correct defects in material, workmanship, or equipment/system which became evident during Operational Testing.

01757 – 11 of 17 Revised 06/03/21

# 1.08 INSTRUMENTATION AND CONTROLS FINE-TUNING

A. After the Process Operational Period, test PCIS system for additional 60 days.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

End of Section

# MANUFACTURER'S CERTIFICATE OF SOURCE TESTING

OWNER	EQPT/SYSTEM
PROJECT NAME	EQPT TAG NO.
PROJECT NO.	EQPT SERIAL NO.
SPECIFICATION NO.	_
SPECIFICATION TITLE	
Comments:	
I hereby certify Source Testing has been per	formed on the above-referenced equipment/system
as defined in the Contract Documents, and r	results conform to the Contract Document
requirements. Testing data is attached.	
Date of Execution:	, 20
Manufacturer:	
Manufacturer's Authorized Representative N	ame (print):
(Authorized	1 Signature)
(///////200	
If applicable, Witness Name (print):	
··· ·· ·· ·· ·· ·· ·· ·· ·· ·· ·· ·· ··	

(Witness Signature)

#### MANUFACTURER'S CERTIFICATE OF INSTALLATION AND FUNCTIONALITY COMPLIANCE

OWNER	EQPT/SYSTEM	
PROJECT NAME	EQPT TAG NO.	
PROJECT NO.	EQPT SERIAL NO.	
SPECIFICATION NO.		
SPECIFICATION TITLE		

I hereby certify that the above-referenced equipment/system has been: (Check Applicable)

Installed in accordance with manufacturer's recommendations.
Inspected, checked, and adjusted.
Serviced with proper initial lubricants.
Electrical/instrumentation and mechanical connections meet quality and safety standards.
All applicable safety equipment has been properly installed.
Functionally tested.
System has been performance tested and meets or exceeds specified performance requirements.

NOTES:

Attach test results with collected data and test report.

Attach written certification report prepared by and signed by the electrical and/or instrumentation subcontractor.

Comments:

I, the undersigned manufacturer's representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate this equipment/system, and (iii) authorized to make recommendations required to ensure that the equipment/system furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date:\_\_\_\_\_, 20 \_\_\_\_\_

Manufacturer:

Manufacturer's Authorized Representative Name (print):

By Manufacturer's Authorized Representative:

(Authorized Signature)

Kansas City, Missouri Water Services Department Birmingham Pump Station Screen Replacement

01757 – 14 of 17 Revised 06/03/21

## COMMISSIONING

#### **TRAINING EVALUATION FORM**

EQ	UIPMENT/SYSTEM ITEM:				
VE	NDOR/MANUFACTURER:				
DA		SENTATIVE:			
1.	Was representative prepared?	Acceptable	Unacceptable	or	N/A
2.	Was an overview description presented?	Acceptable	Unacceptable	or	N/A
3.	Were specific details presented for system components?	Acceptable	Unacceptable	or	N/A
4.	Were alarm and shutdown conditions clearly presented?	Acceptable	Unacceptable	or	N/A
5.	Were step-by-step procedures for starting, stopping, and troubleshooting presented?	Acceptable	Unacceptable	or	N/A
6.	Were routine/preventative maintenance items clearly identified?	Acceptable	Unacceptable	or	N/A
7.	Was the lubrication schedule (if any) discussed?	Acceptable	Unacceptable	or	N/A
8.	Was the representative able to answer all questions?	Acceptable	Unacceptable	or	N/A
9.	Did the representative agree to research and answer unanswered questions?	Acceptable	Unacceptable	or	N/A
10.	Comments:				

11. Overall Rating:

Satisfactory Unsatisfactory

## Note:

Sessions judged "Unsatisfactory" by a majority of attendees shall be revised and conducted again until a satisfactory rating is achieved.

# COMMISSIONING ROLES AND RESPONSIBILITIES MATRIX

NO.	TASK	OWNER	CONTRACTOR	ENGINEER
	Testing and Trainir	ig Phase		
Source	e Testing			
1	Source Testing	Witness	Lead	Witness, Review
Install	ation Testing			
2	Electrical Conductor Testing	No Action	Lead	Witness
3	Electrical Field Acceptance Tests	No Action	Lead	Witness
4	Instrument Field Calibration	No Action	Lead	Witness
5	Network Installation Testing	Witness	Lead	Witness
6	Loop Testing	Witness	Lead	Witness
7	Pressure Testing	No Action	Lead	Witness
8	Leak Testing	No Action	Lead	Witness
9	Holiday Testing	No Action	Lead	Witness
10	HVAC Testing	No Action	Lead	Witness
11	Motor Electrical Testing	No Action	Lead	Witness
Functi	onal Testing			I
12	Network Operational Testing	Witness	Lead	Review
13	Preliminary Run Testing Local/Manual Control	Witness	Lead	Review
14	PCIS Functional Demonstration Testing - Local/Auto Control Testing - Remote/Manual Contact Testing - Alarm Testing - Control Loop Testing	No Action	Lead	Review
15	Subsystem Start-Up and Testing	Witness	Lead	Review
16	Equipment/System Start-Up and Testing	Witness	Lead	Review
17	HVAC Start-Up and Testing	Witness	Lead	Review
18	Corrosion Control Start-Up and Testing	Witness	Lead	Review
19	Wide Area Network Communications Testing	Support	Lead	Witness
20	Manufacturer's Certificate of Installation and Functionality Compliance	No Action	Lead	Witness, Review
Clean	Water Facility Testing			
21	Test Water Management Plan Finalization	Support	Lead	Review
22	Clean Water Facility Testing	Witness	Lead	Witness, Review
	Process Start-Up	Phase		
Proces	ss Start-Up			
23	Commissioning Documentation and Data Review	Review	Support	Lead
24	Start-Up Go/No-Go Decision Criteria	Lead	Support	Review
25	Building and Fire Inspection Compliance Check	No Action	Lead	Witness

NO.	TASK	OWNER	CONTRACTOR	ENGINEER	
	Testing and Training Phase				
26	HVAC Functionality Check	No Action	Lead	Witness	
27	Start-Up Sequence Review	Support	Lead	Review	
28	Temporary Testing Arrangement Finalization	Support	Lead	Support	
29	Start-Up Forms Finalization	Support	Lead	Support	
30	Operation Testing Plan Finalization	Review	Support	Lead	
31	Test Water Management Plan Finalization	Support	Lead	Review	
32	System Testing	Support	Lead	Witness	
33	Control Loop Tuning	Support	Lead	Witness	
34	Process Area Start-Ups	Support	Lead	Witness	
35	Facility-Wide Start-Up	Support	Lead	Witness	
36	Process Control Systems Testing	Support	Lead	Witness	
38	HVAC Final Testing, Adjust, and Balancing	Witness	Lead	Witness, Review	
Proces	ss Operational Period				
39	Operational Testing	Support	Lead	Witness, Review	
40	Final Testing Reports	Support	Lead	Review	
41	Water Quality Testing and Documentation	Support	Lead	Review	
	Instrumentation and Controls	Reliability Phase	9		
Instrur	nentation and Controls Reliability Period				
42	As specified in Section 15950 - Testing, Calibration, and Commissioning				
Legend:      Lead:    Primarily responsible for organization, coordination, and execution of task work product or result.      Support:    Assist the lead with organization, coordination, and execution of task work product or result.      Witness:    Observe and document completion of task work product or result.      Review:    As necessary to accept task work product result.      No Action:    Limited or no involvement.					

# SECTION 01810 – PROJECT DESIGN CRITERIA

## PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Criteria for use in selection of equipment and appurtenances specified in subsequent Sections of these Specifications, or on the Drawings.
  - 2. Criteria for design of tanks and other equipment fabricated off site and shipped to the Work site for installation.
  - 3. Criteria for use in design of anchors for connecting process, mechanical and electrical equipment, and appurtenances to supporting structures.
- B. The criteria included in this Section are general criteria that apply throughout the Work unless more restrictive or more stringent criteria are indicated on the Drawings or in technical Specifications. See Drawings and Specifications for additional criteria relevant to specific locations, materials and equipment.

#### 1.02 REFERENCES

- A. American Society of Civil Engineers (ASCE):
  - 1. 1. 7-10 Minimum Design Loads for Buildings and Other Structures (ASCE 7).
- B. ASHRAE, Incorporated (ASHRAE).
- C. International Code Council (ICC):
  - 1. International Plumbing Code (IPC).
- D. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA):
  - 1. Seismic Restraint Manual: Guidelines for Mechanical Systems, 4th edition.

## 1.03 SUBMITTALS

- A. Design of supports and anchorage for structures:
  - 1. Shop drawings and calculations:
    - a. Complete shop drawings and calculations.
    - b. Calculations shall be signed and sealed by an engineer licensed in the State of Missouri.
  - 2. Seismic design calculations:
- B. a. Where seismic design calculations are specified in this Specification, such requirements will be waived for structures or equipment determined to be in Seismic Design Categories A or B.
- C. 3. Wind design calculations:
  - a. Where wind design calculations are specified in this Specification, such requirements will be waived for structures or equipment located inside other structures.

## 1.04 PROJECT DESIGN CRITERIA – SITE INFORMATION

- A. Location:
  - A. Address: 11011 Birmingham Road in Kansas City, Missouri 64161. Site coordinates (approximate): 39.1741525, -94.4449328.

01810 – 1 of 7 Revised 06/14/21

#### B. Elevation:

1. Operating elevation for equipment: Approximately 734 feet above mean sea level.

## 1.05 PROJECT DESIGN CRITERIA – REGULATORY REQUIREMENTS

A. Code requirements of authorities having jurisdiction over the project are included in Section 01410 - Regulatory Requirements.

#### 1.06 PROJECT DESIGN CRITERIA – OPERATING ENVIRONMENT

- A. Equipment and materials for the Work shall be suitable for performance in a wastewater pump station environment, and under conditions specified in the following paragraphs.
  - 1. See technical specifications for each type of equipment for additional requirements.
- B. Climate data for site:
  - 1. Energy Code Climate Zone: 4A (IECC 2012).
  - 2. Local data:
    - a. Location: Kansas City, Missouri, Kansas City International Airport.
      (1) Data coordinates: Latitude 39.30 N; Longitude 94.71 W.
    - b. Prevailing winds: 12 miles per hour.
    - c. Temperatures Outdoor: As specified in Table 1:

Table 1: Design Temperatures - Outdoor				
Condition	Criteria			
Winter	2.4 degrees Fahrenheit dry-bulb at ASHRAE 99.6 percent.			
Summer	110.5 degrees Fahrenheit dry-bulb / 76.5 degrees Fahrenheit mean coincident wet-bulb at ASHRAE 99.6 percent.			
	Daily mean range: 20.4 degrees Fahrenheit.			
Mean of annual	Maximum: 100 degrees Fahrenheit dry-bulb.			
extremes	Minimum: minus 3.9 degrees Fahrenheit dry-bulb.			

#### d. Temperatures - Indoor: As specified in Table 2

Table 2: Design Temperatures - Indoor		
	Summer (degrees Fahrenheit)	Winter (degrees Fahrenheit)
Process and process equipment areas:		
Unless otherwise noted.	10 degrees above ambient	55

01810 – 2 of 7 Revised 06/14/21

•	Corridors.	10 degrees above ambient	55
•	Electrical, Control, and Mechanical (HVAC equipment) rooms.	85	55
No	on-process areas:		
•	Offices, conference rooms, vestibules, kitchen, restrooms.	75	70
•	Control room, wet analysis room.		
•	PLC, instrument shop, instrument storage, electrical/com room.		
•	Mechanical (HVAC equipment) rooms.	75	70
•	Conditioned Parts Storage Room.	75	70
•	Maintenance bays, oil and tool storage, laundry, janitors closets.	10 degrees above ambient	55

- 3. Outdoor conditions other:
  - a. Humidity: 43.4 to 83.5 percent (NOAA 2002).
  - b. Freeze-thaw conditions: 90-100 frost days per year.
- 4. Indoor conditions other:
  - a. Moisture conditions: As defined in individual equipment sections.
- C. Rainfall design criteria:
  - 1. Reference: 2015 IPC.
    - a. 3.6 inches per hour (100-year, 1-hour storm).

## 1.07 PROJECT DESIGN CRITERIA - STRUCTURAL

- A. GENERAL. 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.
- B. DESIGN CRITERIA. Buildings, non-structural components including anchorage of such items, shall be designed in accordance with the following criteria in PART 3.

General Design Data:

	Building code and references	IBC 2018, ASCE 7-16 "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	768	ft
Wind I	Design Data:		
	Basic factored wind speed, V, Risk Category III	120	mph
	Exposure category	С	
	Importance factor (wind loads), I	N/A	
	Building enclosure classification	Enclosed	
Snow 1	Design Data:		
	Ground snow load, $P_{g}$	20	psf
	Importance factor (snow loads), I	1.1	
	Exposure factor (Ce)	0.9	
	Thermal factor (C <sub>t</sub> )	1.0	
Ice De	sign Data:		
	Nominal ice thickness, t	1.0	in
	Concurrent wind speed, V <sub>c</sub>	40	mph
	Importance factor (ice loads – ice thickness), $I_i$	1.25	
	Importance factor (ice loads – concurrent wind), $I_w$	1.0	
	Seismic Design Data for Non- structural Components:		
	Design short period spectral response acceleration, S <sub>DS</sub>	0.135g	
	Component importance factor, IP	If/As indicated in the Non-Structu Components PART 3	ral
	Seismic Design Category	В	

01810 – 4 of 7 Revised 06/14/21

C. <u>WIND ANCHORAGE</u>. 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, Chapter 6. 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.

## D. <u>SEISMIC DESIGN</u>.

- a. <u>General</u>. 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.
- b. Pre-Engineered Buildings. As Per Architectural Drawings
- c. <u>Non-Structural Components</u>. 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, and in the Non-Structural Components Description PART 3.

The Non-Structural Components Description PART 3 identifies the components that require some level of seismic design. The requirements of this paragraph are applicable only to the items listed in the Non-Structural Components Description PART 3.

All components, and the anchorage of those components to the main structure, shall be shown on construction documents prepared and sealed by a registered design professional that is licensed in the state of the project. The construction documents shall be submitted in accordance with the Submittal Procedures section. Structural calculations shall be submitted when requested by Engineer.

Design of non-structural components shall be in accordance with all applicable provisions of ASCE 7, Chapter 13. Non-structural components shall have sufficient strength and ductility to resist the specified seismic effects, and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code and other referenced codes.

Non-structural components shall be attached so that seismic forces are transferred to the structural system. Curbs that support roof-mounted equipment shall be designed to transfer forces from the equipment into the main structural roof members. 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.

When the Non-Structural Components Description PART 3 indicates that seismic design of any component is required, the component shall be designed to be operable during and following a design level seismic event without collapsing, breaking away from supports, creating an ignition hazard, or releasing any contents.

01810 – 5 of 7 Revised 06/14/21
"W<sub>p</sub>" 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.

Seismic effects that shall be analyzed in the design of piping systems include the dynamic effects of the piping system, contents, and supports. The interaction between piping systems and the supporting structures, including other mechanical and electrical equipment, shall also be considered. Where pipe supports are to be designed by Contractor, as required by the Pipe Supports section, both the piping and support systems shall be designed to meet the applicable requirements of ASCE 7, Chapter 13.

## PART 2 - PRODUCTS

## 2.01 GENERAL

- A. Equipment and materials for the project shall be suitable for the following conditions:
  - 1. Wastewater pump station conditions.
  - 2. Site, environmental and structural loading conditions as specified in this Section.
  - 3. Specific conditions listed in the relevant sections of the Contract Documents for the equipment and products under consideration.
- B. Anchoring and fastening: See the following Sections for materials and installation requirements:
  - 1. Section 03200 Concrete Reinforcment.
  - 2. Section 05500 Metal Fabrications.

## PART 3 – EXECUTION

## 3.01 GENERAL

- A. Design in accordance with the requirements of the building code as specified in Section 01410 -Regulatory Requirements and the references and project-specific design criteria listed in this Section.
- B. In the event of conflicts between design criteria, the more restrictive or severe shall govern.

## 3.02 DESIGN OF SUPPORTS AND ANCHORAGE FOR EQUIPMENT AND TANKS

- A. General:
  - 1. Anchor using anchor bolts, anchor rods, bolts, or welded studs.
  - 2. Anchor bolts used to resist seismic loads and wind forces shall have a standard hex bolt head.
    - a. Do not use anchor bolts fabricated from rod stock with an L or J shape.
      - b. Do not use post-installed anchors (including concrete anchors, sleeve anchors, flush shells, chemical anchors, powder actuated fasteners, or other types of anchor) unless indicated on the Drawings or accepted in writing by the Engineer.
  - 3. Anchor bolt and fastener calculations:
    - a. Design for ductile failure (anchor bolt yield).
    - b. Anchor bolts and fasteners embedded cast into plastic concrete or installed into cured concrete:
      - (1) Design based on a minimum specified 28-day concrete compressive strength of 4,000 pounds per square inch (f'c = 4000 psi).
- B. Seismic loads:
  - 1. Do not use friction to resist sliding resulting from seismic forces. Resist such forces only by direct application of loads to fasteners as bearing, shear, tension, or compression force(s).
  - 2. Do not use more than 60 percent of the weight of the mechanical and electrical equipment for designing anchors for resisting overturning due to seismic forces.
  - 3. For tanks and equipment with varying weight based on the volume of material contained, design anchorage to accommodate both filled and empty conditions.
    - a. Do not use more than 60 percent of the weight of the tank for resisting overturning due to seismic forces.
- C. Wind loads:
  - 1. Design load combinations shall be as specified in ASCE 7.
  - 2. For tanks and equipment with varying weight based on volume of material contained, evaluate anchorage considering both filled and empty conditions.

# END OF SECTION

#### SECTION 02270 TEMPORARY EROSION AND SEDIMENT CONTROL

#### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Silt fence erosion protection.
  - 2. Hay bale silt fence erosion protection.
- B. Related Sections:
  - 1. Section 02300 Earthwork.

### 1.02 QUALITY ASSURANCE

- A. Regulatory Requirements;
  - 1. Comply with all requirements, exemptions, regulations and outflow sampling requirements set forth by local and state agencies.

### PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Silt Fence Fabric: Synthetic filter fabric or a pervious sheet of polypropylene, nylon, polyester, or polyethylene yard, containing ultraviolet ray inhibitors and stabilizers providing a minimum of six months usable construction life at a temperature range from 0 to 120 degrees F., and meeting the following requirements:
  - 1. Sediment retention efficiency: Not less than 85 percent.
  - 2. Grab strength at 20 percent maximum elongation:a. Standard strength fabric: 30 pounds per lineal inch.b. Extra strength fabric: 50 pounds per lineal inch.
  - 3. Flow rate: Not less than 0.30 gallons per square foot per minute.
- B. Silt Fence Posts: Contractor has option of the following:
  - 1. 4 inch diameter pine.
  - 2. 2 inch diameter pine.
  - 1.33 pound per lineal foot steel posts a minimum of 4 feet in length.
     a. Steel posts shall have projections for fastening the fabric.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion:
  - 1. Do not proceed until unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

#### A. Protection:

- 1. Protect trees, shrubs, lawns, other vegetation and other features indicated on Drawings to remain, or not indicated to be removed.
  - a. Provide temporary guards to protect trees and vegetation which are to remain.
  - b. Protect roots over 1-1/2 inch diameter which are cut during construction operations.
    1) Coat cut faces with emulsified asphalt or other acceptable coating formulated for use on damaged plan tissues.
    - 2) Temporarily cover exposed roots with wet burlap to prevent roots from drying out. Cover with earth as soon as possible.
- 2. Protect bench marks, monuments, existing structures, existing fences, existing roads, existing sidewalks, existing paving, existing curbs and other features indicated on Drawings to remain, or not indicated to be removed, from damage and displacement.
  - a. If damaged or displaced, notify Design Professional and correct defects as directed by Engineer.
- 3. Protect above and below grade utilities which are to remain.
- B. Preparation:
  - 1. Use all means necessary to control dust on and near the Work, and on and near off-site storage, and spoil areas, if such dust is caused by performance of the Work of this Section, or if resulting from the condition in which Project Site is left by Contractor.
  - 2. Moisten surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other Work on Project Site.

### 3.03 INSTALLATION

- A. Install erosion control devices at locations indicated on Drawings, and where required to protect adjacent and downstream properties from damage and pollution resulting from erosion caused by the Work of this Contract.
  - 1. Implement erosion control measures indicated on Drawings and additional erosion control measures necessary to prevent damage to adjacent and downstream properties.

- B. Install silt fence located along perimeter of Site or grading limits.
  - 1. Install silt fence fabric from a continuous roll for the length of the silt fence whenever possible to minimize the number of joints.
    - a. Create joints in fabric by securely fastening fabric at the support post with overlap extending to the next post.
  - 2. Drive support post into ground not less than 18 inches.
  - 3. Excavate a 4-inch wide by 8 inch deep trench on up-slope side of silt fence.
    - a. Line trench with silt fence fabric materials.
    - b. Backfill trench with soil or gravel.

### 3.04 MAINTENANCE

- A. Check silt fences after each rainfall event to ensure that they are in proper working order:
  - 1. Check embankments and spillways for erosion, settlement or other damage.
  - 2. Immediately make all necessary repairs.
- B. Inspect silt fences at least once a week.
  - 1. Immediately replace damaged portions of the silt fences, including portions which have collapsed, contain tears, have decomposed, or have become ineffective.
- C. Remove sediment deposits as necessary to provide adequate sediment storage and to maintain the integrity of fences.
- D. Maintain erosion control devices in places as specified until Site is stabilized by pavement, vegetation, or other means.
- E. After site is stabilized, remove erosion control devices, sediment, and debris from Site prior to final grading specified under Section 02300.

## END OF SECTION

## SECTION 02300 EARTHWORK

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Excavation for slabs-on-grade, paving, and grading.
  - 2. Excavation for Site structures.
  - 3. Site filling and backfilling.
  - 4. Drainage course for slabs-on-grade.
  - 5. Consolidation and compaction.
  - 6. Excavation for trenches for utilities and footings.
  - 7. Consolidation and compaction of bedding under utilities.
  - 8. Rough grading.
- B. Related Sections:
  - 1. 02270 Temporary Erosion Control
  - 2. 02517 Site Water

### 1.02 DEFINITIONS

- A. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials, and bottom of over excavation areas if required by the contract document.
- B. Subbase Course: Aggregate layer placed between the subgrade and hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill, when sufficient approved soil material is not available from excavations.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and

dimensions indicated, regardless of the character and density of materials, including reuse or disposal of materials removed.

- 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Design Professional. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Design Professional. Unauthorized excavation, as well as remedial work directed by Design Professional, shall be without additional compensation.
- G. Fill: Suitable materials used to raise existing grades.
- H. Finish Grade: The top surface of sod, top surface of topsoil where sod is not indicated or exposed rock surface where indicated on the drawing.
- I. Trench Backfill: Soil material or controlled low-strength material used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

### 1.03 SUBMITTALS

- A. Submit in accordance with Division 1 unless otherwise indicated.
- B. Product Data:
  - Manufacturer's specifications and technical data for the following:
     a. Geotextile fabric.
  - 2. Include laboratory test reports for the following:
    - a. Granular fill.
    - b. Pavement base course.
- C. Contract Closeout Submittals: Submit in accordance with Division 1.
  - 1. Project Record Documents.
    - a. Accurately record location of underground utilities remaining, rerouted utilities, and new utilities by horizontal dimensions from above grade permanent fixtures, elevations or inverts, and slope gradients.

### 1.04 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm experienced in installation of systems similar in complexity to those required for this Project, plus the following:
  - 1. Not less than 3 years' experience with systems.
  - 2. Successfully completed not less than 5 comparable scale projects using this system.
- B. Testing Agency: A qualified independent geotechnical engineering testing agency shall classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform specified field and laboratory testing.
- C. Pre-Excavation Conference:
  - 1. Convene pre-excavation conference under provision of Division 1, one week prior to commencing Work of this Section.
  - 2. Contractor shall be presiding officer at conference.
  - 3. Conference shall be attended by Contractor, Owner's Representative, testing agency, and earthwork subcontractor.
  - 4. Purpose of conference will be to review contract requirements and discuss schedules, work procedures, acceptable materials specified under this Section, locations where specified materials may be incorporated, and quality control.

### 1.05 PROJECT CONDITIONS

- A. Existing Conditions:
  - 1. Locate existing underground utilities in areas of excavation Work.
    - a. Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by Owner's Representative and then only after acceptable temporary utility services have been provided.
    - b. Provide not less than 72-hours' notice to Design Professional and Owner's Representative and receive written authorization to proceed before interrupting any utility.

### 1.06 MAINTENANCE

- A. Where settling is measurable or observable at excavated areas during correction period required by General Conditions, remove surface (pavement, lawn, or other finish), add backfill material, compact as specified in this Section for location of material, and replace surface treatment.
  - 1. Restore appearance, quality, and condition of surface or finish to match adjacent materials.
  - 2. Eliminate evidence of restoration.

### PART 2 PRODUCTS

### 2.01 MATERIALS

### A. General:

- 1. Provide approved borrow soil materials from off-Site when sufficient approved soil materials are not available from excavations, at no increase in Contract Sum or extension of Contract Time.
- 2. Dispose of any excess materials legally off site at no increase in contract sum or extension of contract time. On site disposal of suitable materials may only be permitted where shown on the drawings.
- 3. Fill and backfill materials shall be subject to the approval of testing agency and the Owner's Representative.
- 4. For approval of fill and backfill materials, notify testing agency and Owner's Representative at least 5 working days in advance of intention to import material.
  - a. Designate proposed borrow area and excavate test pits to permit testing agency to sample as necessary from borrow area for the purpose of making acceptance tests to confirm quality of proposed material.
- B. General Fill Materials
  - 1. Definition: That material used to obtain finish subgrade levels at locations specified under this section.
  - 2. Acceptable material: Excavated on-site material or off-site borrow material which is free from debris, organics, decomposable and corrodible materials, and containing the proper moisture content, liquid limit, and plasticity index to obtain specified compaction requirements.
    - a. Existing on-site material proposed for reuse, and off-site borrow material shall be approved by testing agency.
- C. Low Volume Change Material:
  - 1. Definition: That material used to obtain the upper 12 inches of finish subgrade beneath pavement areas, and material used as trench backfill material in pavement areas.
  - 2. Acceptable material:
    - a. On-site or off-site borrow material which is free from debris, organics, decomposable, and corrodible materials with a liquid limit of less than 45 percent and a plasticity index less than 25, or another material acceptable to the testing agency.
      - 1) Existing on-Site material proposed for reuse, and off-Site borrow material shall be approved by testing agency.

- D. Granular Fill:
  - 1. Definition: Free-draining granular base used beneath building slabs-on-grade and used as backfill behind foundation and retaining walls.
  - 2. Acceptable materials: Clean crushed stone or gravel, free of Shale, clay, friable material, and debris, complying with ASTM C33 Size No. 57.
- E. Pavement Subbase Course:
  - 1. Definition: Granular base used beneath concrete pavement and other pavements indicated on Drawings.
  - 2. Acceptable materials: Comply with APWA Street Construction and Material Specifications, Division II.
- F. Crushed Limestone Fill Material:
  - 1. Definition: That material used at trench backfill under pavements, at locations specified under this Section, and at locations indicated on Drawings.
  - 2. Acceptable materials: Comply with APWA Street Construction and Material Specifications, Division II.
- G. Bedding Materials: Type 1 aggregate per MoDOT Standard Specification for Highway Construction, Section 1007.
- H. Trench Backfill Materials:
  - 1. Pavement areas: APWA Street Construction and Material Specification Division II Section 2602-3c.
  - 2. Other areas: General Fill Material or other materials specified under this Section at locations specified or indicated on Drawings.
- I. Backfill Material
  - 1. Definition: Material requiring placement and compaction with manual procedures because of restricted spaces or new construction.
  - 2. Acceptable materials: Either General Fill Material, Granular Fill Material, or other materials specified under this Section at locations specified or indicated on Drawings.
- J. Unsuitable material
  - 1. Definition: That excavated material which does not meet the consistency requirements of any other defined materials in this Section, including muck, frozen material, organic material, topsoil, rubbish, and rock within the limits defined for General Fill Material
  - 2. Dispose of unsuitable material off-Site, at no increase in Contract Sum or extension of Contract Time.

a. Submit an acceptable agreement with the property owner on whose property the unsuitable material is placed.

### PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion.
  - 1. Verify location and elevations of existing building foundations.
  - 2. Verify location and elevations of existing underground utilities.
  - 3. Verify erosion control systems are in place.
  - 4. Do not proceed until unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Protection:
  - 1. Protect trees, shrubs, lawns, other plant growth, and other features indicated on Drawings to remain.
  - 2. Protect bench marks, monuments, existing structures, existing fences, existing roads, existing sidewalks, existing paving, and existing curbs from damage caused by settlement, lateral movement, undermining, washout, and other hazards caused by Work of this Section.
    - a. If damaged or displaced, notify Owner's Representative and correct defects as directed by Owner's Representative.
  - 3. Protect above and below grade utilities which are to remain.
  - 4. Protect adjacent and downstream properties from pollution, sedimentation, or erosion caused by the work of this Contract.
- B. Preparation:
  - 1. Use all means necessary to control dust on and near the Work, and on and near off-Site borrow storage, and spoil areas, if such dust is caused by performance of the Work of this Section, or if resulting from the condition in which Project Site is left by Contractor.
  - 2. Moisten surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other Work on Project Site.
  - 3. Identify required lines, levels, contours, and datum.
  - 4. Identify above and below grade utilities.
  - 5. Provide and maintain positive surface drainage.

#### 3.03 WATER CONTROL

- A. Provide berms or channels to prevent flooding of subgrades.
- B. Prevent infiltration of water into excavations from whatever sources as may exist.
- C. Prevent ponding of water on finish subgrades.
- D. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- E. Prevent flooding of Project Site and surrounding areas.
- F. Promptly remove water collection in depressions.
  - 1. Provide and maintain ample means and devices with which to remove and dispose of water entering excavations.
  - 2. Ensure dry excavations and preservation of final lines and grades of bottoms of excavations.

#### 3.04 EXCAVATION, GENERAL

- A. Use of explosives is not permitted.
- B. Excavation above subgrade as defined in paragraph 1.2 of this section is unclassified and includes excavation of any material encountered regardless of its character including rock, soil materials, debris, and other obstructions and shall be included in the base bid.
- C. Perform excavation to the lines and grades indicated on Drawings within a tolerance of 0.10 foot.
  - 1. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.
- D. Perform Excavation Work in compliance with applicable requirements of authorities having jurisdiction, including United States Department of Labor, Occupational Safety and Health Administration (OSHA) "Construction Standards for Excavations, 29 CFR Part 1926".
- E. Perform Work in a manner and sequence that will provide drainage at all times and that will prevent surface water from draining into excavations.
- F. Protect subgrades and foundation soils against freezing temperatures and frost.
  - 1. Provide protective insulation materials as necessary.
- G. When excavating through roots, perform Work by hand cutting roots with sharp axe.
- H. Excavation cut shall not interfere with normal 45 degree bearing splay of foundations.
- I. Machine slope banks to comply with local codes, ordinances, and requirements of agencies having jurisdiction.

- 1. Provide materials for shoring and bracing.
  - a. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
  - b. Extend shoring and bracing as excavation progresses
- 2. Control surface drainage down slopes.
- 3. Cover slopes to prevent loss of moisture content of soil and to prevent raveling.
- J. When materials encountered at subgrade are determined to be unacceptable for use by testing agency, remove such material to depths and limits determined by testing agency.
  - 1. Backfill with material acceptable to testing agency and compact to density equal to the specified requirements for subsequent fill material.
- K. Where depressions result from, or have resulted from, the removal of surface or subsurface obstructions, open depressions to equipment working width, and remove debris and soft material as directed by testing agency, at no increase in Contract Sum or extension of Contract time.
  - 1. Backfill with material acceptable to testing agency and compact to density equal to the specified requirements for subsequent fill material, at no increase in Contract Sum or extension of Contract Time.
- L. Backfill and compact unauthorized over-excavations as specified for the area at which it occurs, at no increase in Contract Sum or extension of Contract Time.
  - 1. Backfill with material acceptable to testing agency and compact to density equal to the specified requirements for subsequent fill material, at no increase in Contract Sum or extension of Contract Time.
- M. Stockpile excavation material which testing agency has approved for reuse.
  - 1. Stockpile soil materials without intermixing soil materials with different consistencies and gradation.
  - 2. Place, grade, and shape stockpiles to drain surface water.
  - 3. Do not stockpile within drip line of trees which are to remain.
  - 4. Cover stockpiles to prevent wind-blown dust.
- N. Remove unacceptable excavation material from Site, at no increase in Contract Sum or extension of Contract Time.
- O. Hand trim excavations.
  - 1. Remove loose matter.

- P. Excavation for Footings and Foundations:
  - 1. Do not disturb bottom of excavation.
    - a. Excavate by hand to final grade immediately prior to placement of concrete reinforcement.
    - b. Trim bottom of excavations to required lines and grades to leave solid base to receive other work.
  - 2. Drill probe holes at exposed bottom of excavations as directed by testing agency.

## 3.05 TRENCH EXCAVATIONS

- A. Use of explosives is not permitted.
- B. Trench excavation is unclassified and includes excavation to required exposed subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, debris, and other obstructions.
- C. Excavate trenches to gradients, lines, depths, and elevations indicated on Drawings, within a tolerance of 0.10 foot.
- D. Perform excavation Work in compliance with applicable requirements of authorities having jurisdiction, including United States Department of Labor, Occupational Safety and Health Administration (OSHA) "Construction Standards for Excavations, 29 CFR Part 1926".
- E. Do not perform trench excavation in areas to receive fill until fill operations are complete to an elevation of not less than 24 inches above the top of the proposed pipe or conduit for which the trench is to receive.
- F. Perform Work in a manner and sequence that will provide drainage at all times and that will prevent surface water from draining into trenches.
- G. Protect subgrades against freezing temperatures and frost.
- H. Provide protective insulation materials as necessary.
- I. When excavating through roots, perform Work by hand cutting roots with a sharp axe.
- J. Excavation cut shall not interfere with normal 45 degree bearing splay of foundations.
- K. Excavate trenches to uniform width, sufficiently wide to enable installation of utilities, compaction of backfill along sides of utilities, and to allow safe inspection of installed utilities.
- L. Excavate trenches 6 inches deeper than bottom of pipe elevation to allow for bedding course
  - 1. Hand excavate for bell of pipe.
  - 2. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
  - 3. Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

- 4. Provide materials for shoring and bracing.
  - a. Maintain shoring and bracing in trenches regardless of time period trenches will be open.
  - b. Extend shoring and bracing as excavation progresses.
- 5. Control surface drainage down slopes.
- 6. Cover slopes to prevent loss of moisture content of soil and to prevent raveling.
- 7. Hand trim trenches.
  - a. Remove loose matter.
- M. When subgrade materials are encountered which testing agency determines to be unacceptable for use, remove such material to depths and limits determined by testing agency:
  - 1. Backfill with material acceptable to testing agency and compact to density equal to the specified requirements for subsequent fill material.
  - 2. Removal and replacement of unacceptable material will be paid on basis of Unit Prices included in the Contract Documents.
- N. Where depressions result from, or have resulted from the removal of surface or subsurface obstructions, open depressions to equipment working width, and remove debris and soft material as directed by testing agency at no increase in Contract Sum or extension of Contract Time.
  - 1. Backfill with material acceptable to testing agency and compact to density equal to the specified requirements for subsequent fill material, at no increase in Contract Sum or extension of Contract Time.
- O. Stockpile excavation material which testing agency has approved for reuse.
  - 1. Stockpile soil materials without intermixing soil materials with different consistencies and gradations.
  - 2. Place, grade, and shape stockpiles to drain surface water.
  - 3. Do not stockpile within drip line of trees which are to remain.
  - 4. Cover stockpiles to prevent wind-blown dust.
- P. Remove unacceptable excavation material from Site, at no increase in Contract Sum or extension of Contract Time.
  - 1. Submit an acceptable agreement with the property owner on whose property the unsuitable material is placed.

#### 3.06 SUBGRADE PREPARATION AT PAVEMENTS

#### A. General:

- 1. Excavation for subgrade preparation is unclassified and includes excavation to required subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, debris, and other obstructions.
- 2. Testing agency shall be present to observe proof-rolling of subgrades in pavement and sidewalk areas prior to placement of fill and shall be present during placement and compaction of fill materials in pavement and sidewalk areas. Testing agency shall also be present to observe proof-rolling of finished subgrades prior to installation of pavement and sidewalk sections.
- 3. Fill material shall not be placed, spread, or rolled while the material is frozen or thawing, or during unfavorable weather conditions.
- 4. Moisture condition or dry fill material as required to obtain specified moisture content limits.
  - a. Material which is too wet to allow proper compaction, as determined by testing agency, may be spread and permitted to dry assisted by disking, harrowing, or pulverizing.
- 5. Place fill material using spreading equipment capable of obtaining uniform loose lift thickness.
- 6. Compact fill material using equipment appropriate to the material being compacted, as determined by testing agency.
- 7. When Work is interrupted by rain, do not resume Work until testing agency indicates that moisture content and density of previously placed fill area is as specified.
- 8. Where soil has been softened or eroded by flooding or placement during unfavorable weather conditions, remove damaged areas and recompact to required density.
- 9. In excavations where testing agency determines that subgrade material is unacceptable, remove unacceptable material and backfill in accordance with procedures determined by testing agency.
- 10. Minimize construction traffic, including foot traffic, from pavement finished subgrades in order to prevent unnecessary disturbances of subgrade materials.
  - a. If testing agency determines that finished subgrades have been disturbed, remove disturbed areas and replace and recompact to required density as directed by testing agency.
  - b. If testing agency determines that rutting has occurred, excavate 6 inches, or other depth as directed by testing agency, of subgrade material and recompact as specified for affected area.
  - c. Testing agency shall be present during compaction of material.

- B. In cut areas below pavements requiring less than 12 inches of fill to obtain finish subgrade elevations, and a lateral distance of 4 feet outside pavement areas, excavate existing material to a depth of not less than 6 inches below bottom of pavement subbase course.
  - 1. Proof-roll subgrade and repair as required in paragraph 3.6.E below, then scarify to a depth of 6 inches to result in a surface free from ruts, hummocks, and other uneven features which, in the opinion of the testing agency, would prevent uniform compaction by the equipment proposed for use.
    - a. Moisture condition subgrade to achieve moisture content specified in this Section.
    - b. Compact to a minimum of 95 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698.
      - 1) Field density tests shall be taken after the compaction of each layer of fill by testing agency.
      - 2) When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
  - 2. After scarifying, moisture conditioning, and recompacting, backfill areas using approved materials placed in loose lifts not exceeding 8 inches.
    - a. Compact each lift to a minimum of 95 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698.
      - 1) Field density tests shall be taken after the compaction of each layer of fill by testing agency.
      - 2) When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
  - 3. Protect excavations from excessive wetting and drying during construction. a. Remove water entering excavation, and remove disturbed or softened soil.
  - 4. Maintain subgrade moisture content within specified range until pavements are installed.
    - a. Rework non-complying area as required to achieve specified requirements as directed by testing agency.
    - b. Recompact and retest until required density and moisture content is obtained.
- C. In areas below pavements requiring 12 inches or more of fill to obtain finish subgrade elevations, and a lateral distance of 4 feet outside pavement areas, proofroll existing subgrade in presence of testing agency using a fully loaded tandem axle dump truck or similar type of pneumatic tired equipment with a minimum gross weight of 25 tons.
  - 1. Remove soft areas as directed by testing agency and recompact in loose 9 inch lifts to a minimum of 95 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698.
    - a. Field density tests shall be taken after the compaction of each layer of fill by testing agency.
    - b. When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.

- 2. After proofrolling operations are performed and observed soft areas repaired, place approved material in loose lifts not exceeding 8 inches.
  - a. Compact each lift to a minimum of 95 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698.
    - 1) Field density tests shall be taken after the compaction of each layer of fill by testing agency.
    - 2) When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
- 3. Fill operations shall continue in compacted layers until finish subgrade elevations have been obtained.
  - a. Compact each lift to a minimum of 95 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698.
    - 1) Field density tests shall be taken after the compaction of each layer of fill by testing agency.
    - 2) When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
- 4. Protect excavations from excessive wetting and drying during construction. a. Remove water entering excavation, and remove disturbed or softened soil.
- 5. Maintain subgrade moisture content within specified range until pavements are installed.
  - a. Rework non-complying area as required to achieve specified requirements as directed by testing agency.
  - b. Recompact and retest until required density and moisture content is obtained.
- D. Tolerances
  - 1. Top surface of finish subgrade under paved areas: Plus or minus  $\frac{1}{4}$  inch from required elevations.
- E. Immediately prior to placement of pavement subbase course and pavements, proofroll subgrade in presence of testing agency using a fully loaded tandem axle dump truck or similar type of pneumatic tired equipment with a minimum gross weight of 25 tons.
  - 1. Remove soft areas as directed by testing agency and recompact in loose 9 inch lifts to a minimum of 95 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698.
    - a. Field density tests shall be taken after the compaction of each layer of fill by testing agency.
    - b. When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.

#### 3.07 GENERAL SITE FILL

### A. General:

- 1. Testing agency shall be present during placement and compaction of fill material.
- 2. Fill material shall not be placed, spread, or rolled while the material is frozen of thawing, or during unfavorable weather conditions.
- 3. Moisture condition or dry fill material as required to obtain specified moisture limits.
- 4. Material which is too wet to allow proper compaction, as determined by testing agency, may be spread and permitted to dry assisted by dishing, harrowing, or pulverizing.
- 5. Place fill material using spreading equipment capable of obtaining uniform loose lift thickness.
- 6. Compact fill material using equipment appropriate to the material being compacted, as determined by testing agency.
- 7. When Work is interrupted by rain, do not resume Work until testing agency indicates that moisture content and density of previously placed fill area is as specified.
- 8. Where soil has been softened or eroded by flooding or placement during unfavorable weather conditions, remove damaged areas and recompact to required density.
- B. Perform grading to the contours and elevations indicated on Drawings:
  - 1. Uniformly grade areas to a smooth surface, free from irregular surface changes.
  - 2. Provide a smooth transition between existing adjacent grades and new grades.
- C. Place general fill material in systematic and uniform horizontal lifts not exceeding the following loose-depth-measurements:
  - 1. For fill material to be compacted with heavy compaction equipment: 9 inches.
  - 2. For fill material to be compacted with hand operated tampers: 4 inches.
- D. Under sidewalks and ramps compact each lift of material to a minimum of 95 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698
  - 1. In other areas, compact each lift of material to a minimum of 90 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698.
    - a. Field density tests shall be taken after the compaction of each layer of fill by testing agency.
    - b. When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework on-complying area as required to achieve specified requirements.

- E. Bench existing slopes horizontal sections equal in width to equipment used.
- F. Where embankments, regardless of height, are placed against hillsides or existing embankments having a slope of steeper than 1 vertical to 5 horizontal, bench or step existing slope in approximately 24 inch rises:
  - 1. Place fill in lifts not exceeding 9 inches in loose-depth-measurement
  - 2. Compact material bladed out, bottom area which was cut to form benches, and fill material being placed, to a minimum of 95 percent of the material's maximum Standard Proctor dry density with a moisture content between 0 and +4 percent above optimum moisture content in accordance with ASTM D698.
    - a. Field density tests shall be taken after the compaction of each layer of fill by testing agency.
    - b. When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
- G. Remove surplus materials from Site, at no increase in Contract Sum or extension of Contract Time.
  - 1. Submit an acceptable agreement with the property owner on whose property the material is placed.
- H. Tolerances:
  - 1. Top surface of finish subgrade under paved areas: Plus or minus <sup>1</sup>/<sub>4</sub> inch from required elevations.
  - 2. Top surface of finish subgrade under unpaved surfaces: Plus or minus <sup>1</sup>/<sub>2</sub> inch from required elevations.

### 3.08 INSTALLATION OF GRANULAR FILL

- A. Immediately prior to placement floor slab granular base, testing agency will evaluate subgrade to determine whether moisture content is within specified range, and whether subgrade has been disturbed.
  - 1. In areas where testing agency determines subgrade is not within specified moisture content range, remove non-complying areas and replace and recompact to required density, within specified moisture content range, as directed by testing agency.
    - a. Field density tests shall be taken after the compaction of each layer of fill by testing agency.
    - b. When test indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
  - 2. If testing agency determines that rutting has occurred or other detrimental conditions exist, excavate 6 inches, or other depth as directed by testing agency, of subgrade material and recompact as specified for affected area.
    - a. Field density tests shall be taken after the compaction of each layer of fill by testing

agency.

- b. When tests indicate that any layer of fill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
- B. Place granular fill in equal continuous layers not exceeding 6 inches.
  - 1. Compact granular fill using heavy vibrating equipment, in 3 passes, to achieve a total compacted thickness of 4 inches in presence of Owner's representative or testing agency.
  - 2. Compact granular fill in confined areas using a combination of manually operated vibratory plates and "wacker" compaction equipment.
- C. Tolerances:
  - 1. Top surface of finish subgrade under slabs-on-grade: Plus or minus <sup>1</sup>/<sub>4</sub> inch from required elevations.

### 3.09 INSTALLATION OF PAVEMENT SUBBASE COURSE

- A. Place pavement subbase course in equal continuous layers not exceeding 6 inches.
  - 1. Compact granular fill for pavement and sidewalk subbase course to a minimum of 95 percent of the material's maximum standard proctor dry density in accordance with ASTM D698.
  - 2. Compact granular fill in confined areas using a combination of manually operated vibratory plates and "wacker" compaction equipment.
  - 3. Qualitative tests shall be taken after the compaction of each layer of fill by testing agency.
- B. Tolerances:
  - 1. Top surface of finish subgrade under paved areas: Plus or minus  $\frac{1}{4}$  inch from required elevations.

### 3.10 BEDDING AND INITIAL BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated on Drawings.
  - 1. Install materials in continuous layers not exceeding 6 inches compacted depth.
- B. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Install bedding to a depth of 6 inches below bottom of pipe bell or conduit, to an elevation of 6 inches above pipe or conduit.
- D. Compact bedding materials by slicing with a shovel and compacting with vibratory plate and "wacker" compaction equipment.

- E. Compact initial backfill above haunches of pipe with hand guided equipment. Compact to 95percent of maximum density in accordance with ASTM D698.
- F. Support pipe and conduit during placement and compaction of bedding fill.
- 3.11 INSTALLATION OF BACKFILL
  - A. Backfill excavations promptly, but not before completion of the following:
    - 1. Surveying location of underground utilities for Record Documents
    - 2. Testing, inspecting, and approval of underground utilities
    - 3. Removal of concrete forms
    - 4. Removal of lumber, rock, paper, and other debris from areas to be backfilled
    - 5. Removal of temporary shoring, bracing, and sheeting
  - B. Backfill areas to contours and elevations indicated on Drawings, using unfrozen backfill material
    - 1. Do not backfill over porous, wet, frozen, thawing, or spongy surfaces
    - 2. Do not backfill during unfavorable weather conditions
    - 3. Moisture condition or dry backfill material as required to obtain specified moisture content limits.
      - a. Material that is too wet to allow proper compaction, as determined by testing agency
    - 4. Place backfill material using equipment capable of obtaining uniform loose lift thickness
    - 5. Compact backfill material using equipment appropriate to the material being compacted, as determined by testing agency
    - 6. When Work is interrupted by rain, do not resume Work until testing agency indicates that moisture content and density of previously laced backfill areas is as specified
    - 7. Where soil has been softened or eroded by flooding or placement during unfavorable weather conditions, remove damaged areas and recompact to required density
  - C. Backfilling of curbs, slabs-on-grade, and other structures whose foundation is unprotected from water shall be accomplished as soon as forms are removed, to eliminate possibility of softening of subbase below structure
  - D. Backfill foundation walls with granular material, not less than 24 inches in width, to an elevation of 2 feet below finish grade.
    - 1. Backfill simultaneously on each side of unsupported foundation walls.
    - 2. Backfill upper 2 feet using General Fill Material.

- E. Backfill trenches to contours and elevations indicated on Drawings, using unfrozen backfill material.
  - 1. Do not backfill over porous, wet, frozen, or spongy surfaces.
  - 2. Do not backfill during unfavorable weather conditions.
  - 3. Moisture condition or dry backfill material as required to obtain specified moisture content limits.
    - a. Material which is too wet to allow proper compaction, as determined by testing agency, may be spread and permitted to dry assisted by disking, harrowing, or pulverizing.
  - 4. Place backfill material using equipment capable of obtaining uniform loose lift thickness.
    - a. Employ a placement method of backfill operations which does not disturb or damage utilities in trenches.
- F. Backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings with concrete.
  - 1. Place concrete to elevation equal to bottom of footings.
- G. Compaction of General Backfill
  - 1. Maintain optimum moisture content of backfill materials to attain required compaction density.
  - 2. General Fill Materials used for backfill shall be placed in lifts not exceeding 9 inches in loose-depth-measure and compacted as specified for General Site Fill
  - 3. Granular Fill Materials used for backfill shall be placed in lifts not exceeding6 inches in loose-depth-measure and compacted as specified for Granular Fill.
  - 4. Field density tests shall be taken after the compaction of each layer of backfill by testing agency.
    - a. When tests indicate that any layer of backfill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
- H. Compaction of Trench Backfill Under Pavements and Roadways
  - 1. Compact backfill material using equipment appropriate to the material being compacted, as determined by testing agency.
  - 2. Maintain optimum moisture content of backfill materials to attain required compaction density.
  - 3. When Work is interrupted by rain, do not resume Work until testing agency indicates that moisture content and density of previously placed backfill area is as specified.
  - 4. Where soil has been softened or eroded by flooding or placement during unfavorable weather conditions, remove damaged areas and recompact to required density.

- 5. General Fill Material used for backfill shall be placed in lifts not exceeding 4 inches in loose-depth-measure with each lift compacted as specified in this section.
- 6. MoDOT Standard Specification for Highway Construction Type 5 aggregate used for backfill shall be placed in lifts not exceeding 6 inches in loose-depth-measure and compacted to a minimum of 97 percent of the material's maximum Standard Proctor dry density with a moisture content near optimum in accordance with ASTM D698.
- 7. Field density tests shall be taken after the completion of each layer of backfill by testing agency.
  - a. When tests indicate that any layer of backfill or portion thereof does not meet the required compaction density or moisture content, rework non-complying area as required to achieve specified requirements.
- I. Slope grade away from building not less than 12 inches in 10 foot for a distance of not less than 6 feet outside of building lines.
  - 1. Make grade changes gradual.
  - 2. Blend slopes into level areas.
  - 3. Remove surplus materials from Site, at no increase in Contract Sum or extension of Contract Time
  - 4. Submit an acceptable agreement with the property owner on whose property the material is placed
- J. Tolerances:
  - 1. Top surface of finish subgrade under paved areas: Plus or minus 1/4 inch from required elevations
  - 2. Top surface of finish subgrade under unpaved areas. Plus or minus ½ inch from required elevations

## 3.12 FIELD QUALITY CONTROL

- A. Tests:
  - 1. Field density shall be taken by testing agency as specified in this Section in accordance with ASTM D 698.
  - 2. Field density tests will be taken at a rate of not less than 1 tests for every 2,000 square feet of building slab-on grade area for each layer of fill and backfill, but in no case fewer than 3 tests for each layer of fill and backfill.
  - 3. Field density tests will be taken at a rate of not less than 1test for every 50 lineal feet of footing subgrade for each layer of fill and backfill, but in no case fewer than 6 tests for each layer of fill and backfill.
  - 4. Field density tests will be taken at a rate of not less than 1 test for every 50 lineal feet of foundation wall backfill for each layer of backfill, but in no case fewer than 2 tests along

a wall face for each layer of backfill.

- 5. Field density tests will be taken at a rate of not less than 1 test for every 2,000 square feet of pavement area for each layer of fill and backfill, but in no case fewer than 3 tests for each layer of fill and backfill.
- 6. Field density tests will be taken at a rate of not less than 1 test for every 4,000 square feet of general Site fill area for each layer of fill and backfill, but in no case fewer than 6 tests for each layer of fill and backfill.
- 7. Moisture content tests shall be taken by testing agency as specified in this Section in accordance with ASTM D6938.
- 8. Moisture content test will be taken for each field density test.
- 9. Bearing capacity of undisturbed soil under footings will be evaluated by testing agency to verify an allowable bearing pressure of 3,000 pounds per square foot.
  - a. Test methods will include field strength tests such as static or dynamic cone test.
- B. When tests indicate that any layer of backfill or portion thereof does not meet the specified compaction density or moisture content, rework non-complying area as required to achieve specified requirements as directed by testing agency.
  - 1. Recompact and retest until required density and moisture content is obtained.

## 3.13 PROTECTION

- A. Protect newly graded areas from freezing and erosion.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
  - 1. Testing agency shall be present during compaction of material.

# END OF SECTION

#### SECTION 02755 CONCRETE PAVEMENT

#### PART 1 GENERAL

#### 1.01 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Other Action Submittals:
  - 1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

#### 1.02 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready- mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

#### PART 2 PRODUCTS

#### 2.01 STEEL REINFORCEMENT

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.
- C. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.
- D. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A; coated, deformed.
- E. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars.
- F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

## 2.02 CONCRETE MATERIALS AND MIXTURES

- A. For work within public right-of-way, comply with City Standards and Specifications.
- B. For work on private property: comply with KCMMB as follows:
  - 1. The 28-day compressive strength for concrete shall be 5,000 psi and designated as "KCMMB 5K". Mixes for High Early Strength Concrete shall meet the same requirements as stated below for standard 5K mixes (designated as "KCMMB HE"), and any additional requirements noted below specific to High Early Strength Concrete. Compressive strength shall be determined in accordance with ACI 318. All mix designs shall have a unique number designated by the concrete supplier. This unique number must match the number on the concrete delivery ticket or the concrete will be rejected.
  - 2. Coarse aggregate shall be entirely granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite, or trap rock. All coarse aggregate shall come from a large, accessible, uniform geological formation and be easily field identifiable in concrete. All coarse aggregate test results shall not exceed the following percentages by weight:

	Maximum Allowable %
AASHTO T103 Soundness by Freeze/Thaw 50 cycles	
3/4 - 3/8	1.0%
3/8 - #4	2.0%
ASTM C127	
Absorption %	0.5%
ASTM C123 Lightweight Pieces	
% Light Weight Pieces	0.5%
ASTM C142 Clay Lumps and Friable	
% Deleterious	0.3%
Coal and Lignite	
% Coal and Lignite	0.05%
ATM C117 Material Finer than #200 by washing	
% Passing	0.5%
Sum of all deleterious	
% Total deleterious	1.0%
ASTM C88 Sulfate Soundness (MgSO4) Weighted % loss	
3/4 - 3/8	0.5%
3/8 - #4	4.0%
ASTM C131 LA Abrasion	
% Loss	28.0%

- 3. Coarse aggregates shall meet the gradation requirements of the current ASTM C33. The acceptable gradation sizes shall be number 1 through 7, 56, 57, 67, 357 or 467. Mix designs shall specify the gradation designation.
- 4. Limestone found in concrete mixes, delivered from centrally batched concrete plants shall not exceed 3% by weight of the coarse aggregate fraction. Limestone found in all other concrete mixes shall not exceed 2% by weight.
- 5. Fine aggregate shall meet the requirements set forth in the current ASTM C33. The percentage by weight of clay lumps and friable particles shall not exceed 0.25%. The percentage by weight of material passing the no. 200 sieve shall not exceed 2%. The percentage by weight of coal and lignite shall not exceed 0.25%. Soundness shall be determined using magnesium sulfate.
- 6. Aggregates in mixes must be proportioned to have a minimum of 55% coarse aggregate by weight.
- 7. Cementitious Materials: The total mass of cementitious materials shall be a minimum of 600 pounds per cubic yard of concrete and consist of one of the following options:
  - a. A minimum of 450 pounds per cubic yard of ASTM C 150 Type I, II, I/II, or III portland cement combined with one of the following:
    - 1) ASTM C 989 Grade 100 or 120 Ground Granulated Blast Furnace Slag (GGBFS) at a maximum of 25% of the combined total cementitious weight.
    - ASTM C 618 Class F fly ash at a maximum of 25% of the combined total cementitious weight. In addition, Loss on Ignition is limited to a maximum of 3.0%.
  - b. Manufactured ASTM C 595 Blended Hydraulic Cement Type IS or IP with the following limitations:
    - 1) Type IS The slag constituent shall not exceed 25% of the mass of the combined portland cement and slag.
    - 2) Type IP The pozzolan constituent shall not exceed 25% of the mass of the combined portland cement and pozzolan.
  - c. The total alkali content of the concrete shall be limited to the sum of the acid soluble alkali content of portland cement plus either one-sixth the alkali content of fly ash or one-half of the alkali content of slag, to a maximum of 5 lb/yd3.
    - Note: Mortar Bar Expansion tests are required if the cementitious combination contains less than 25% GGBFS or Class F fly ash. If a mix design with less than 25% GGBFS of Class F fly ash is submitted, the mortar bar expansion shall be a maximum of 0.10% at 16 days when tested according to ASTM C 1567. The C 1567 test shall be performed on cementitious combinations submitted as noted above and include aggregate combinations from one of the three following options:
      - a) Test each coarse aggregate and percentage submitted with Missouri River sand obtained from the Holliday Sand Riverside Dredge. (For each cementitious combination tested, this option only allows this specific coarse aggregate source and percentage to meet the Mortar Bar Expansion test.)
      - b) Test with 55% Pink Quartzite from the Dell Rapids Pit, Dell Rapids, South Dakota and 45% Missouri River sand obtained from the Holliday Sand Riverside Dredge. (For each cementitious combination tested, this option allows any approved coarse aggregate at 55% to meet the Mortar Bar Expansion test.)

- c) Test using 100% Missouri River sand obtained from the Holliday Sand Riverside Dredge. (For each cementitious combination tested, this option allows any aggregate combination to meet the Mortar Bar Expansion test.)
- 2) Regardless of which option above is used, all aggregate combinations must meet the rest of the KCMMB Specification. The Mortar Bar Expansion shall be a maximum of 0.10% at 16 days.
- 8. Water cement ratio shall not exceed 0.44. Only potable water shall be used. The minimum water cement ratio shall be 0.25.
- 9. Air Entrainment shall meet the requirements set forth in the current ASTM C260. The percentage of air content by volume shall be 6.5% plus/minus 1.5%. Mixes shall be designed for 6.5% air content. For precast manufacturing facilities that utilize dry cast concrete, air contents will be determined by taking three separate cores at random intervals throughout the KCMMB year. If submitting for the first time, drycast suppliers can receive conditional approval by submitting a mix design that meets all the KCMMB specifications except for air content. They will be conditionally approved until receiving results from the first air content test. The core locations will be specified by the participating KCMMB member after the project has been constructed. The cores shall be 4" diameter partial depth through walls of finished concrete products. Provide a Linear-Traverse Test (ASTM C457), Procedure A, on each core using the proposed mix design. Provided, for each mix design submitted, the average of the three tests is above 5% total air content, with no single sample being less than 4%, the facility will be approved to dry cast concrete structures using that mix until April 1st of the following year. Test results for each ASTM C457 test should include the total air content and the corresponding specific surface in square inches per cubic inch, the spacing factor in inches, and a recalculation of the air content, specific surface and spacing factor using bubbles with a size of 0.04" and less. If submitting the same mix design for the following year, the last three air test can be submitted for conditional air content approval.
- 10. All concrete delivery tickets shall include the plant name, design w/c ratio, batch weights per cubic yard, total batched weight of all materials for quantity delivered, time batched, design slump, water withheld (2 gal/yd maximum, no water shall be withheld from HE concrete), allowable slump range, moisture correction for aggregates, and dosages of all approved admixtures. Pre-cast concrete manufactures shall keep concrete delivery tickets on file for one year. Certifications for the pre -cast concrete shall be provided when the product is delivered to the job site.
- 11. For High Early mix designs, test results for the ASTM C 1074 shall be submitted. Compression tests may be performed at times other than those in ASTM C 1074 provided the tests occur within the time limits of ASTM C 1074 and give the majority of data points early in the time frame. Control of Slump, time of set, and workability shall be controlled by use of admixtures only, NO water shall be withheld from a high early mix.

## 2.03 CURING MATERIALS

A. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

### 2.04 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber.

#### PART 3 EXECUTION

#### 3.01 EXAMINATION AND PREPARATION

- A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
- B. Remove loose material from compacted subbase surface and place and compact approved replacement material immediately before placing concrete.

#### 3.02 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

#### 3.03 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

## 3.04 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, to match jointing of existing adjacent concrete paving.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

#### 3.05 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, placing, and consolidating concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

#### 3.06 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has dis-appeared and concrete surface has stiffened sufficiently to permit operations. Float surface with powerdriven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
  - 2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating floatfinished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

### 3.07 COLD AND HOT WEATHER CONCRETE PLACEMENT

- A. Cold Weather Concrete:
  - 1. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when the descending air temperature in the shade and away from artificial heat reaches thirty-five (35°) degrees F. Concrete operations may be resumed when the ascending air temperature in the shade and away from artificial heat reaches thirty five (35°) degrees F.
  - 2. When concrete work is authorized during cold weather, the concrete may be heated in accordance with ACI specifications. The temperature of the concrete shall be not less than sixty ( $60^{\circ}$ ) degrees F and not more than eighty ( $80^{\circ}$ ) degrees F at the time of placement in the forms.
  - 3. No concrete shall be placed on frozen subgrade. Sudden cooling of concrete shall not be permitted. Concrete exposed to frost action or freezing weather shall be removed and replaced at the Contractor's expense.

- 4. A sufficient supply of approved blanketing material shall be provided and placed on all concrete placed between November 1 and April 1 and at other times when the ambient air temperature is expected to drop below forty (40°) degrees F. Blanketing materials shall protect the concrete and maintain a minimum temperature of forty (40°) degrees F in the concrete as measured on the surface. Concrete shall be covered for at least four days.
- B. Hot Weather Concrete:
  - The provisions of this section shall apply to all concrete work, which is done when the air temperature is above eighty (80°) degrees F at the time of placement. The temperature of the concrete, when placed, shall not be high enough to cause excessive loss of slump, flash set or cold joints. Forms, reinforcing and sub-grade surfaces against which the concrete is to be placed shall be wetted down immediately before placement. In no case shall the temperature of the concrete, when placed, exceed ninety (90°) degrees F.
  - 2. When the air temperature exceeds ninety (90°) degrees F and as soon as practicable without causing damage to the surface finish, all exposed concrete shall be kept continuously moist by means of fog sprays, wet burlap, cotton mats, or other means acceptable to the Engineer at no expense to the Owner. This cooling with water shall be in addition to the initial sealing by membrane curing compound.
  - 3. No concrete shall be placed when the air temperature is above ninety-five (95) degrees F.

### 3.08 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by curing compound.

### 3.09 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
  - 1. Elevation: 1/8 inch.
  - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  - 3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch (6 mm).
  - 4. Joint Spacing: 3 inches.

- 5. Contraction Joint Depth: Plus 1/4 inch, no minus.
- 6. Joint Width: Plus 1/8 inch, no minus.

## 3.10 OPENING TO TRAFFIC

A. The concrete pavement shall not be opened for light traffic until the concrete is at least 72 hours old and has attained a minimum compressive strength of 3000 pounds per square inch. The pavement shall not be opened to all types of traffic until the concrete is at least 72 hours old and has attained a minimum compressive strength of 3500 pounds per square inch. If high early strength concrete is used, the pavement may be opened to all types of traffic when the concrete has attained a minimum compressive strength of 3500 pounds per square inch. If high early strength concrete is used, the pavement may be opened to all types of traffic when the concrete has attained a minimum compressive strength of 3500 pounds per square inch. Pavement shall be cleaned prior to opening to traffic.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: The Owner will engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing shall be performed according to the following requirements:
  - 1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
  - 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
  - 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
  - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
  - 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
  - 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 100 cu. yd., plus one set for each additional 100 cu. yd. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
  - 7. In-place pavement thickness will be determined by test core samples. One core sample will be taken for every 1,000 square yard or less of installed pavement, with no fewer than 3 cores taken.

- 8. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
- 9. When strength of field-cured cylinders is less than 85 percent of companion laboratorycured cylinders, current operations shall be evaluated, and corrective procedures shall be provided for protecting and curing in-place concrete.
- 10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results shall be reported in writing to Owner, Design Professional, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Design Professional but will not be used as the sole basis for approval or rejection.
- E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Design Professional. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

## 3.12 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Design Professional.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

## END OF SECTION

## SECTION 03100 CONCRETE FORMWORK

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes: Concrete formwork.

### 1.02 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. 117 Specifications for Tolerances for Concrete Construction and Materials and Commentary.
- B. ASTM International (ASTM):
  1. A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. NSF International (NSF):
  1. 61 Drinking Water System Components Health Effects.
- D. Underwriters Laboratories (UL).

### 1.03 DEFINITIONS

A. Green concrete: Concrete with less than 100 percent of the minimum specified compressive strength f'c.

## 1.04 SYSTEM DESCRIPTION

- A. Design requirements:
  - 1. Design of concrete forms, falsework, and shoring in accordance with local, state, and federal regulations.
  - 2. Design forms and ties to withstand concrete pressures without bulging, spreading, or lifting of forms.
- B. Performance requirements:
  - 1. Construct forms so that finished concrete conforms to shapes, lines, grades, and dimensions indicated on the Drawings.
  - 2. It is intended that surface of concrete after stripping presents smooth, hard, and dense finish that requires minimum amount of finishing.
  - 3. Provide sufficient number of forms so that the work may be performed rapidly and present uniform appearance in form patterns and finish.
  - 4. Use forms that are clean and free from dirt, concrete, and other debris.a. Coat with form release agent if required, prior to use or reuse.

### 1.05 SUBMITTALS

- A. Information on proposed forming system:
  - 1. Submit in such detail as the Engineer may require assuring himself that intent of the Specifications can be complied with by use of proposed system.
  - 2. Alternate combinations of plywood thickness and stud spacing may be submitted.

- B. Form release agent. NSF 61 certification prepared by NSF, Underwriters Laboratories (UL) or other, similar, nationally recognized testing laboratory acceptable to the Engineer.
- 1.06 QUALITY ASSURANCE
  - A. Qualifications of formwork manufacturers: Use only forming systems by manufacturers having a minimum of 5 years' experience, except as otherwise specified, or accepted in writing by the Engineer.
  - B. Regulatory requirements: Install work of this Section in accordance with local, state, and federal regulations.

# PART 2 PRODUCTS

## 2.01 MANUFACTURED UNITS

- A. Forms: Built-up plywood:
  - 1. Built-up plywood forms may be substituted for prefabricated forming system subject to following minimum requirements:
    - a. Size and material:
      - 1) Use full size 4-foot by 8-foot plywood sheets, except where smaller pieces are able to cover entire area.
      - 2) Sheet construction: 5-ply plywood sheets, 3/4-inch nominal, made with 100 percent waterproof adhesive, and having finish surface that is coated or overlaid with surface which is impervious to water and alkaline calcium and sodium hydroxide of cement.
    - b. Wales: Minimum 2-inch by 4-inch lumber.
    - c. Studding and wales: Contain no loose knots and be free of warps, cups, and bows.
- B. Forms: Steel or steel framed:
  - 1. Steel forms:
    - a. Rigidly constructed and capable of being braced for minimum deflection of finish surface.
    - b. Capable of providing finish surfaces that are flat without bows, cups, or dents.
  - 2. Steel framed plywood forms:
    - a. Provide forms that are rigidly constructed and capable of being braced.
    - b. Plywood paneling: 5-ply, 5/8-inch nominal or 3/4-inch nominal, made with 100 percent waterproof adhesive, and having finish surface that is coated or overlaid with surface which is impervious to water and alkaline calcium and sodium hydroxide of cement.
- C. Form release agent.
  - 1. Effective, non-staining, bond-breaking coating compatible with form surfaces and concrete mixes used.
  - 2. Certified for conformance to NSF 61 and leaving no taste or odor on the concrete surface.
- D. Form ties:
  - 1. General:
    - a. Provide form ties for forming system selected that are manufactured by recognized manufacturer of concrete forming equipment.
    - b. Do not use wire ties or wood spreaders of any form.
- c. Provide ties of type that accurately tie, lock, and spread forms.
- d. Provide form ties of such design that when forms are removed, they locate no metal or other material within 1-1/2 inches of the surface of the concrete.
- e. Do not allow holes in forms for ties to allow leakage during placement of concrete.
- 2. Cone-snap ties:
  - a. Cone-snap ties shall form a cone shaped depression in the concrete with minimum diameter of 1 inch at the surface of the concrete and minimum depth of 1-1/2 inches.
  - b. Provide neoprene waterseal washer that is located near the center of the concrete.
- 3. Taper ties:
  - a. Neoprene plugs for taper tie holes: Size so that after they are driven, plugs are located in center third of wall thickness.
- E. Incidentals:
  - 1. External angles:
    - a. Where not otherwise indicated on the Drawings, provide with 3/4-inch bevel, formed by utilizing true dimensioned wood or solid plastic chamfer strip on walkways, slabs, walls, beams, columns, and openings.
    - b. Provide 1/4-inch bevel formed by utilizing true dimensioned wood or solid plastic chamfer strip on walkways, walls, and slabs at expansion, contraction, and construction joints.
  - 2. Keyways: Steel, plastic, or lumber treated with form release agent.
  - 3. Dovetail anchor system: System consisting of dovetail slots cast into the concrete, dovetail anchors that tie the masonry veneer to dovetail slots, and continuous wires that are embedded in the masonry and connect to the dovetail anchors.
    - a. Dovetail slot: 18 gauge, hot-dip galvanized after fabrication in accordance with ASTM A153, foam filled, and in 10-foot lengths.
      - 1) Manufacturers: One of the following or equal:
        - a) Hohmann and Barnard, Inc., Model No. 305.
        - b) Heckmann Building Products, Inc., Model No. 100.
    - b. Dovetail anchors: 20 gauge, 1 inch wide, hot-dip galvanized after fabrication in accordance with ASTM A153, and with seismic notch for attachment to wire embedded in masonry.
      - 1) Manufacturers: One of the following or equal:
        - a) Hohmann and Barnard, Inc., Model No. 303SV.
        - b) Heckmann Building Products, Inc., Model No. 361.

## PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Site verification of conditions:
  - 1. Do not place concrete until forms have been checked for alignment, level, and strength, and mechanical and electrical inserts or other embedded items for correct location.

#### 3.02 INSTALLATION

- A. Forms: Built-up plywood:
  - 1. Studding:

- a. Spaced at 16 inches or 24 inches on center.
- b. Closer spacing may be required depending upon strength requirements of the forms, in order to prevent any bulging surfaces on faces of finished concrete work.
- c. Install studs perpendicular to grain of exterior plys of plywood sheets.
- 2. Wales: Form wales of double lumber material with minimum size as specified in this Section.
- 3. Number of form reuses: Depends upon durability of surface coating or overlay used, and ability to maintain forms in condition such that they are capable of producing flat, smooth, hard, dense finish on concrete when stripped.
- B. Forms: Steel or steel framed:
  - 1. Steel forms:
    - a. Adequately brace forms for minimum deflection of finish surface.
  - 2. Steel framed plywood forms:
    - a. Rigidly construct and brace with joints fitting closely and smoothly.
    - b. Number of form reuses: Depends upon durability of surface coating or overlay used.
  - 3. Built-up plywood forms: As specified in this Section may be used in conjunction with steel forms or steel framed plywood forms for special forming conditions such as corbels and forming around items which will project through forms.
- C. Form bracing and alignment:
  - 1. Line and grade: Limit deviations to tolerances which will permit proper installation of structural embedded items or mechanical and electrical equipment and piping.
  - 2. Formwork:
    - a. Securely brace, support, tie down, or otherwise hold in place to prevent movement.
    - b. Make adequate provisions for uplift pressure, lateral pressure on forms, and deflection of forms.
  - 3. When second lift is placed on hardened concrete: Take special precautions in form work at top of old lift and bottom of new lift to prevent:
    - a. Spreading and vertical or horizontal displacement of forms.
    - b. Grout "bleeding" on finish concrete surfaces.
  - 4. Pipe stubs, anchor bolts, and other embedded items: Set in forms where required.
  - 5. Cracks, openings, or offsets at joints in formwork: Close those that are 1/16-inch or larger by tightening forms or by filling with acceptable crack filler.
- D. Forms: Incidentals:
  - 1. Keyways: Construct as indicated on the Drawings.
  - 2. Reentrant angles: May be left square.
  - 3. Level strips: Install at top of wall concrete placements to maintain true line at horizontal construction joints.
  - 4. Inserts:
    - a. Encase pipes, anchor bolts, steps, reglets, castings, and other inserts, as indicated on the Drawings or as required, in concrete.
  - 5. Pipe and conduit penetrations:
    - a. Install pipe and conduit in structures as indicated on the Drawings, and seal with specified Joint Sealants materials.
- E. Form release agent:
  - 1. Apply in accordance with manufacturer's instructions.

- F. Form ties:
  - 1. Cone-snap ties: Tie forms together at not more than 2-foot centers vertically and horizontally.

## 3.03 FORM REMOVAL

- A. Keep forms in place for at least the periods indicated in the following paragraphs.
  - 1. Vertical forms:
    - a. Keep vertical forms in place for a minimum of 24 hours after concrete is placed.
    - b. If, after 24 hours, concrete has sufficient strength and hardness to resist surface or other damage, forms may be removed.
  - 2. Other forms and shoring: Keep in place:
    - a. Sides of footings: 24 hours minimum.
    - b. Vertical sides of beams, girders, and similar members: 48 hours minimum.
    - c. Bottom of slabs, beams, and girders: Until concrete strength reaches specified strength  $f'_c$  or until shoring is installed.
    - d. Shoring for slabs, beams, and girders: Shore until concrete strength reaches specified strength.
    - e. Wall bracing: Brace walls until concrete strength of beams and slabs laterally supporting wall reaches specified strength.
- B. Green concrete:
  - 1. No heavy loading on green concrete will be permitted.

## 3.04 SURFACE REPAIRS AND FINISHING

- A. Immediately after forms are removed, carefully examine concrete surfaces, and repair any irregularities in surfaces and finishes as specified in Section 03300 Cast-in-Place Concrete.
- B. Form ties: Remove form ties from surfaces. Fill tie holes as follows:
  - 1. Remove form ties from surfaces.
  - 2. Roughen cone shaped tie holes by heavy sandblasting before repair.
  - 3. Dry pack cone shaped tie holes with dry-pack mortar as specified in Section 03600 Grouting.
  - 4. Taper ties:
    - a. After forms and taper ties are removed from wall, plug tie holes with neoprene plug as follows:
      - 1) Heavy sandblast and then clean tie holes.
      - 2) After cleaning, drive neoprene plug into each of taper tie holes with steel rod. Final location of neoprene plug shall be in center third of wall thickness. Bond neoprene plug to concrete with epoxy.
      - 3) Locate steel rod in cylindrical recess and against middle of plug during driving.
        - a) At no time are plugs to be driven on flat area outside cylindrical recess.
    - b. Dry-pack of taper tie holes:
      - 1) After installing plugs in the holes, coat the hole surface with epoxy bonding agent and fill with dry-pack mortar as specified in Section 03600 Grouting.
        - a) Place dry-pack mortar in holes in layers with thickness not exceeding tie hole diameter and heavily compact each layer.
        - b) Dry-pack the outside of the hole no sooner than 7 days after the inside of the hole has been dry packed.

- c) Wall surfaces in area of dry-packed tie holes: On the water side of water containing structures and the outside of below grade walls:
  - (1) Cover with minimum of 10 mils of epoxy gel.
  - (2) Provide epoxy gel coating on wall surfaces that extend minimum of 2 inches past dry-pack mortar filled tie holes.
  - (3) Provide finish surfaces that are free from sand streaks or other voids.

#### 3.05 TOLERANCES:

- A. Finished concrete shall conform to shapes, lines, grades, and dimensions indicated on the Drawings.
- B. Construct work within the tolerances in accordance with ACI 117, except as modified in the following paragraphs or as indicated on the Drawings.
  - 1. General:
    - a. At certain locations in the Work, tolerances required for equipment placement and operation may be more restrictive than the general tolerance requirements of this Section.
    - b. Confirm equipment manufacturers' required tolerances for location and operation of equipment that will be installed, and construct concrete to satisfy those requirements.
  - 2. Slabs:
    - a. Slope: Uniformly sloped to drain when slope is indicated on the Drawings.
    - b. Slabs indicated to be level: Have maximum vertical deviation of 1/8-inch in 10foot horizontal length without any apparent changes in grade.
  - 3. Circular tank walls:
    - a. The Contractor may deviate from finish line indicated on the Drawings by use of forms with chord lengths not to exceed 2 feet.
  - 4. Inserts and embedments:
    - a. Set inserts and embedments to tolerances required for proper installation and operation of equipment or systems to which insert pertains.
    - b. Maximum tolerances: As follows:

Item	Tolerance
Sleeves and inserts	Plus 1/8 Minus 1/8 inches.
Anchor bolts:	
Projected ends	Plus 1/4 Minus 0.0 inches.
Axial alignment	Not more than 2 degrees off the axis indicated on the Drawings.
Setting location	Plus 1/16 Minus 1/16 inches.

C. Remove and replace work that does not conform to required tolerances. Procedures and products employed in and resulting from such re-work shall be acceptable to the Engineer.

# END OF SECTION

### SECTION 03150 HYDROPHILIC RUBBER WATERSTOP

PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes: Hydrophilic rubber waterstop.

#### 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - 2. D570 Standard Test Method for Water Absorption of Plastics.
  - 3. D792 Standard Test Methods for Density and Specific Gravity of Plastics by Displacement.
  - 4. D2240 Standard Test Method for Rubber Property-Durometer Hardness.

### 1.03 SUBMITTALS

- A. General:
  - 1. Submit the following items for each type, style and size of hydrophilic waterstop to be installed.
  - 2. Product data:
    - a. Manufacturer's product data sheets.
      - 1) Include complete physical dimensions, expansion characteristics, and laboratory test reports indicating that average material properties conform to the requirements specified.
      - 2) Provide data sheets for all materials to be included in the waterstop system.
  - 3. Samples:
    - a. Minimum 6-inch long samples of each type of waterstop to be used if requested by the Engineer.
  - 4. Manufacturer's installation instructions:
    - a. Installation instructions and recommended installation details for the complete waterstop system, and for each component used in that system.

## PART 2 PRODUCTS

## 2.01 HYDROPHILIC RUBBER WATERSTOP

- A. General:
  - 1. System composed of flexible hydrophilic urethane polymer with preformed strips, adhesives, paste, fasteners, and other accessories required for a complete and watertight installation.
    - a. To ensure compatibility of materials, a single manufacturer shall provide all products and accessories for the hydrophilic waterstop system.
    - b. Products incorporating bentonite are not acceptable under this Section.
    - c. Provide waterstop and accessories resistant to degradation under cyclic wetting and drying and to chemicals typically found in water treatment structures.

- B. Hydrophilic strip waterstop:
  - 1. Pre-formed strips of flexible hydrophilic rubber designed to undergo controlled expansion when exposed to moisture.
  - 2. Strip waterstops reinforced with embedded stainless-steel wire mesh designed to direct expansion in the thickness direction of the strip, and to limit expansion in the longitudinal and width directions.
  - 3. Provide normal or low-expansion pressure as scheduled and as indicated on the Drawings.

Property	Test Method	Required Result	
Hardness Hs	ASTM D2240	Not less than 30 <u>+</u> 6 Shore A Durometer Type A.*	
Tensile Strength	ASTM D412	Not less than 142 pounds per square inch*	
Elongation	ASTM D412	Not less than 500 percent*	
Specific Gravity	ASTM D792	1.18 <u>+</u> 0.15	
Expansion Coefficient by Volume	(manufacturer)	Not less than 1.9	
Water Absorption	ASTM D570	Not more than 0.15 percent after 24 hours	

4. In accordance with the following performance requirements:

\* Based on pressed sheet of compound.

- 5. Manufacturers: One of the following or equal:
  - a. Hydrophilic strip: Adeka Ultra Seal USA: MC-2010MN.
  - b. Low expansion hydrophilic strip: Adeka Ultra Seal USA: KBA-1510FP.]
- C. Hydrophilic strip waterstop:
  - 1. Pre-formed strips of flexible hydrophilic rubber designed to undergo controlled expansion when exposed to moisture:
    - a. Strips manufactured to limit expansion in directions parallel to the plane of the joint, and to direct expansion against confining material perpendicular to that plane.
  - 2. Provide normal or low-expansion pressure as scheduled and as indicated on the Drawings.
  - 3. Manufacturers: One of the following or equal:
    - a. Hydrophilic strip:
      - 1) Adeka Ultra Seal USA, MC-2010MN.
      - 2) Greenstreak, Hydrotite CJ1020-2K.
    - b. Low expansion hydrophilic strip:
      - 1) Adeka Ultra Seal USA, KBA-1510FP.
      - 2) Greenstreak, Hydrotite CJ0725-3K.
- D. Hydrophilic paste waterstop.
  - 1. Single-component gun grade paste of hydrophilic rubber designed to undergo controlled expansion when exposed to moisture after initial curing.
  - 2. Manufacturers: One of the following or equal:
    - a. Adeka Ultra Seal USA: P-201.
    - b. Greenstreak: Leakmaster LV-1.

## PART 3 EXECUTION

## 3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and recommended details.
- B. Prepare concrete joint surfaces:
  - 1. Use wire brushing or scraping to expose an uncontaminated, solid surface.
  - 2. Clean prepared surface with high-pressure air or water to remove residue and debris.
  - 3. Confirm that prepared surfaces conform to manufacturer's recommendations for surface profile and moisture conditions before installing materials.
- C. Provide manufacturer's recommended lap, splice, and corner details for hydrophilic waterstops.
  - 1. Use hydrophilic paste at all corner joints and overlap splices of hydrophilic strips.
- D. Hydrophilic strip waterstop:
  - 1. Install primers and adhesives when recommended by the manufacturer before setting hydrophilic strips.
  - 2. Keep hydrophilic strip taut during the fastening process.
  - 3. Secure hydrophilic strip in place with concrete nails, screws, or adhesive.
  - 4. Provide installation with no gap between the hydrophilic strip and the concrete to which it is attached. At rough or irregular surfaces, set hydrophilic strip waterstop strip in a bead of hydrophilic paste.
    - a. Fill all voids and rough areas under the hydrophilic strip with hydrophilic paste.
    - b. Allow hydrophilic paste to cure in accordance with manufacturer's recommendations before encapsulating paste in fresh concrete.

## 3.02 SCHEDULE

- A. At the following joint locations/conditions, use the hydrophilic strip waterstop configuration noted unless otherwise indicated on the Drawings.
- B. Concrete construction joints:
  - 1. Under all of the following conditions, use hydrophilic strip waterstop set in a bed of hydrophilic paste waterstop, and screw strip waterstop to concrete surface:
    - a. Slab or wall thickness is greater than 10 inches.
    - b. Waterstop is placed between 2 rows of steel reinforcement.
    - c. Concrete cover from waterstop to nearest concrete face is at least 4 inches.
  - 2. Under any one of the following conditions, use low-expansion hydrophilic strip waterstop set in bed of hydrophilic paste waterstop and screw strip to concrete surface:
    - a. Waterstop is placed on 1 side of a single row of steel reinforcement, or
    - b. Concrete cover from waterstop to nearest concrete face is less than 4 inches.
- C. Pipe penetrations through concrete:
  - 1. Pipe diameter less than 4 inches: Not allowed.
  - 2. Pipe diameter of 4 to 24 inches: Continuous bead of hydrophilic paste water stop, minimum 1/4-inch-high by 1/2 inch wide, encircling pipe.
  - 3. Pipe diameter greater than 24 inches: Continuous hydrophilic strip waterstop around perimeter of pipe, with hydrophilic paste seal at lapped ends of strip.

## END OF SECTION

## SECTION 03200 CONCRETE REINFORCING

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Reinforcing bars.
    - a. Carbon steel.
  - 2. Thread bars.
  - 3. Bar supports.
  - 4. Tie wires.
  - 5. Mechanical reinforcing bar couplers.
  - 6. Mechanical reinforcing bar end anchors (terminators).

#### 1.02 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. 318 Building Code Requirements for Structural Concrete and Commentary.
  - 2. SP-66 ACI Detailing Manual.
- B. American Iron and Steel Institute (AISI).
- C. American Welding Society (AWS):
  1. D1.4 Structural Welding Code Reinforcing Steel.
- D. ASTM International (ASTM):
  - 1. A615 Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- E. Concrete Reinforcing Steel Institute (CRSI):
  - 1. Manual of Standard Practice.
- F. ICC Evaluation Service (ICC-ES):
  - 1. AC133 Acceptance Criteria for Mechanical Connector Systems for Steel Reinforcing Bars.
  - 2. AC347 Acceptance Criteria for Headed Deformed Bars.

#### 1.03 DEFINITIONS

- A. Architectural concrete: Concrete surfaces that will be exposed to view in the finished work. For purposes of this Section, architectural concrete includes the following:
  - 1. Concrete surfaces specified to receive paints or coatings.
  - 2. Exposed concrete in open basins, channels, and similar liquid containing structures, that is located above a line 2 feet below the normal operating water surface elevation in that structure.
- B. Bars: Reinforcement or reinforcing bars as specified in this Section.
- C. Evaluation Report: Report prepared by ICC-ES, or by other testing agency acceptable to the Engineer and to the Building Official, that documents testing and review of a product to

confirm that it complies with the requirements of designated ICC-ES Acceptance Criteria, and its acceptance for use under the Building Code specified in Division 1 - Regulatory Requirements.

- D. Give away bars: Reinforcing bars that are not required by the Contract Documents, but are installed by the Contractor to provide support for the required reinforcing bars.
- E. Wire supports: Metal reinforcing supports constructed of steel wire as specified. Includes individual high chairs, continuous high chairs, bolsters and other similar configurations and shapes.

## 1.04 SYSTEM DESCRIPTION

A. The drawings contain notes describing the size and spacing of reinforcement and its placement, details of reinforcement at wall corners and intersections, and details of extra reinforcement around openings in concrete, and other related information.

### 1.05 SUBMITTALS

- A. General:
  - 1. Submit in accordance with Submittal Procedures.
  - 2. Changes to reinforcement in Contract Documents:
    - **a**. Indicate in a separate letter submitted with shop drawings any changes to reinforcement indicated on the Drawings or specified.
    - b. Such changes will not be acceptable unless Engineer has accepted them in writing.
- B. Product data:
  - 1. Bar supports:
    - a. Wire bar supports:
      - 1) Schedule of support materials to be provided and locations of use.
      - 2) Complete bar schedule, bar details, and erection drawings to conform to ACI SP-66.
      - 3) Drawing with each type of bent bar marked with identification mark. Straight bars shall have mark number or be identified by size and length.
      - 4) Erection drawings shall be clear, easily legible, and to a minimum scale of:
        - a) 1/4 inch = 1 foot (1:50).
        - b) 1/8 inch = 1 foot (1:100) if bars in each face are shown in separate views.
      - 5) Size and location of all openings.
      - 6) Concrete protective cover.
      - 7) Grade of steel.
      - 8) Lap splice lengths.
      - 9) Dowel lengths (per manufacturer)
  - 2. Mechanical reinforcing bar couplers. For each type and/or series to be provided:
    - a. Evaluation Report documenting compliance with the requirements of ICC-ES AC133.
    - b. Details, properties, and dimensions of couplers. Include type or size identification, and bar size(s) and grade(s) for which the coupler is suitable.
    - c. Manufacturer's installation and testing instructions.

- d. Manufacturer's statement that products installed in accordance with manufacturer's recommended procedures will develop strengths and limit slip as specified in this Section.
- 3. Mechanical reinforcing bar end anchors (terminators).
  - a. Evaluation Report documenting compliance with the requirements of ICC-ES AC307.
  - b. Details, properties, and dimensions of end anchors. Include type or size identification, and bar size(s) and grade(s) for which the end anchor is suitable.
  - c. Manufacturer's installation and testing instructions.
  - d. Manufacturer's statement that products installed in accordance with manufacturer's recommended procedures will develop strengths and limit slip as specified in this Section.
- C. Shop drawings:
  - 1. Reinforcement shop drawings:
    - **a**. Submit drawings showing bending and placement of reinforcement required by the Contract Documents.
    - b. Clearly indicate structures or portions of structures covered by each submittal.
      - Submit reinforcement shop drawings for each structure as a complete package. Submittals addressing only a portion of a structure will be rejected and returned without review, unless such presentation is accepted by Engineer in advance.
    - c. Shop drawings shall conform to the recommendations of the CRSI Manual of Standard Practice and ACI SP-66.
    - d. Use the same bar identification marks on bending detail drawings, placement drawings, and shipping tags.
    - e. Submittals consisting solely of reinforcing bar schedules, without accompanying placement drawings, will not be accepted unless accepted under prior written agreement with Engineer.
  - 2. Reinforcement placement drawings:
    - a. Clearly show placement of each bar listed in the bill of materials, including additional reinforcement at corners and openings, and other reinforcement required by details in the Contract Documents.
    - b. Clearly identify locations of reinforcement with coatings (e.g. galvanized or epoxy) and with yield strength other than ASTM A615, Grade 60.
    - c. Show splice locations.
    - d. Indicate locations of mechanical reinforcing couplers if used.
    - e. Show locations of reinforcing bar end anchors, if used.
  - 3. Reinforcement fabrication drawings:
    - a. If bend types or nomenclature differs from that recommended in the CRSI Manual of Standard Practice, provide details showing bend types and dimensional designations.

Clearly identify reinforcement with coatings and with yield strength other than ASTM A615, Grade 60.

- D. Samples (when requested by Engineer):
  - 1. Bar supports / wire reinforcement supports: Samples of each type of chair and bolster proposed for use. Submit with letter stating where each type will be used.
- E. Test reports:
  - 1. Certified copy of mill test for each steel used. Show physical properties and chemical analysis.

- a. Mill test reports may be submitted as record documents at the time the reinforcement from that heat of steel is shipped to the site.
- b. In such cases, submit certificates under the shop drawing submittal number with the letter "R" (for record date) appended to the end (e.g., of the reinforcement was submitted as 03320-002-1, deliver the associated mill certificate as submittal 03320-002-1R).
- 2. Mechanical reinforcing bar couplers:
  - a. Current Evaluation Report confirming that couplers provide specified tension and compression strength and conform to specified limits on total slip within the coupler.
  - b. Certified copy of mill tests for heat(s) of steel incorporated into the reinforcing bar couplers shipped.
  - c. For threaded sleeve type couplers, heat treatment lot numbers for each shipment.
- 3. Reinforcing bar end anchors:
  - a. Current Evaluation Report confirming that end anchors provide specified tension strength.
  - b. Certified copy of mill tests for heat(s) of steel incorporated into the materials shipped.
- F. Manufacturer's instructions:
  - 1. Mechanical reinforcing bar couplers:
    - a. Manufacturer's installation instructions.
    - b. Manufacturer's instructions for confirmation testing of couplers after reinforcing bars have been inserted into the couplers.
  - 2. Mechanical reinforcing bar end anchors:
    - a. Manufacturer's installation instructions.
    - b. Manufacturer's instructions for confirmation testing of end anchors.
- G. Special procedures:
  - Welding procedures conforming to AWS D1.4 for reinforcement to be field welded.
     a. Procedures qualification record.
- H. Qualifications statements:
  - 1. Welder qualifications.
- I. Closeout documents:
  - 1. Field quality control and inspection reports.
  - 2. Field quality assurance special inspection and testing reports.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
  - 1. Deliver bars bundled and tagged with identifying tags.
- B. Acceptance at site:
  - 1. Reinforcing bars: Deliver reinforcing bars lacking grade identification marks with letter containing manufacturer's guarantee of grade.

#### 1.07 SEQUENCING AND SCHEDULING

- A. Bar supports:
  - 1. Do not place concrete until samples and product data for bar supports have been accepted by Engineer.

## PART 2 PRODUCTS

## 2.01 MATERIALS

- A. Reinforcing bars:
  - 1. Provide reinforcement of the grades and quality specified, fabricated from new stock, free from excessive rust or scale, and free from unintended bends or other defects affecting its usefulness.
  - 2. Reinforcing bars:
    - a. ASTM A615 Grade 60 deformed bars, including the following requirements,
      - Actual yield strength based on mil tests of reinforcement provided shall not exceed the minimum yield strength specified in this Section by more than 18,000 pounds per square inch.
      - 2) Ratio of actual ultimate tensile strength to actual tensile yield strength shall not be less than 1.25.
  - 3. Reinforcing bars designated or required to be welded:
    - a. Low-alloy, ASTM A706 Grade 60, deformed bars.
    - b. ASTM A615 Grade 60 deformed bars may be used in lieu of ASTM A706 Grade 60 if following requirements are satisfied.
      - 1) Welding procedures conforming to AWS D1.4 are submitted to Engineer.
      - 2) The specific location for proposed substitution is acceptable to Engineer.
- B. Thread bars:
  - 1. Reinforcing bars conforming to ASTM A615, Grade 75 unless otherwise indicated on the Drawings, and having a continuous rolled-in pattern of thread-like deformations along entire length.
    - a. Substitution of shop-cut threads on regular ASTM A615 or A706 reinforcing bars is not permitted.
  - 2. Thread bar hardware, including nuts (hex and jamb), couplers, and washers (flat, spherical, and beveled):
    - a. Provided by same manufacturer as the threaded bars.
    - b. Capable of developing a load equal to at least 125 percent of the yield strength of the threaded bar.
  - 3. Manufacturers: One of the following or equal:
    - a. DYWIDAG Systems International (DSI), DYWIDAG Threadbar®:
      - 1) Bar and accessories hot-dip galvanized in accordance with ASTM A123.
    - b. Williams Form Engineering Corp., Grade 75 all-thread rebar:
      - 1) Bar and accessories hot-dip galvanized in accordance with ASTM A153 to minimum 3 mils coating thickness.
- C. Bar supports:
  - 1. Wire supports:
    - a. All stainless steel bar supports:
      - 1) Conforming to CRSI Manual of Standard Practice recommendations for types and details, but custom fabricated entirely from stainless steel wire conforming to ASTM A493, AISI Type 316.
    - b. Stainless steel protected bar supports:
      - 1) Conforming to CRSI Manual of Standard Practice Class 2, Type B, and consisting of bright basic wire support fabricated from cold-drawn carbon steel wire with stainless steel ends attached at the bottom of each leg.

- 2) Stainless steel wire ends shall conform to ASTM A493, AISI Type 316 and shall extend at least 3/4 inch inward from the formed surface of the concrete.
- c. Bright basic wire bar supports.
- 1) Conforming to CRSI Manual if Standard Practice, Class 3.
- 2. Plastic supports:
  - a. Manufacturers: The following or equal:
    - 1) Aztec Concrete Accessories.
- 3. Deformed steel reinforcing bar supports:
  - a. Fabricated of materials and to CRSI details recommended for typical reinforcement embedded in concrete and bent to dimensions required to provide specified clearances and concrete cover.
- 4. Precast concrete bar supports ("dobies"):
  - a. Pre-manufactured, precast concrete blocks with cast-in annealed steel wires, 16gauge or heavier.
  - b. Compression strength of concrete: Equal to or exceeding the compression strength of the surrounding concrete.
  - c. Block dimensions:
    - 1) Height to provide specified concrete cover.
    - 2) Footprint not less than 3 inches by 3 inches, and adequate to support the weight of the reinforcement and maintain specified concrete cover without settling into the underlying surface.
- D. Tie wires:
  - 1. General use: Black annealed steel wire, 16-gauge or heavier.
- E. Mechanical reinforcing bar couplers [and end anchors]:
  - 1. General:
    - a. Only products conforming to the requirements of ACI 318 for mechanical splices, and holding a current Evaluation Report that documents the following performance characteristics, will be considered for use.
    - b. Strength of coupler: Capable of developing tension and compression strength not lower than the lesser of the following:
      - 1) ACI 318 "Type 2" units: In static tension and compression:
        - a) Minimum 125 percent of the ASTM-specified minimum yield strength of the reinforcement being spliced[ or terminated].
        - b) Minimum 100 percent of the ASTM-specified minimum ultimate strength of the reinforcement being spliced[ or terminated].
    - c. Slip of reinforcing bars within coupler: Total slip of the reinforcing bars within the splice sleeve limited as follows:
      - 1) For bar sizes #14 and smaller, elongation between gauge points measured clear of the splice sleeve not exceeding 0.010 inches after coupler has been loaded to a tension of 30,000 pounds per square inch and load relaxed to a tension of 3,000 pounds per square inch.
    - d. Fabrication:
      - 1) Threaded joints:
        - a) Provide threaded ends designed so that cross-threading of bars will not occur during assembly.
        - b) Fabricate male ends for female couplers using coupler manufacturer's bar threading equipment to ensure proper taper and thread engagement.
      - 2) Mark each sleeve with heat treatment lot number.
  - 2. Couplers: Threaded Reinforcing bar splice at construction joints.

- a. Steel sleeve butt splice with tapered internal threads in forged or swaged head, and nailing flange for attaching to forms. Provide with matching, tapered male-threaded dowels for insertion and tightening into threaded sleeve after form removal.
  - 1) Provide sleeve with factory-installed plugs to prevent concrete mortar from entering internally threaded coupler.
  - 2) Provide optional clipped nailing flanges as required to maintain minimum specified concrete cover over all surfaces of coupler.
- b. Holding current Evaluation Report demonstrating acceptance under ICC-ES AC133.
- c. Manufacturers: One of the following or equal:
  - 1) Dayton Superior, DBDI Splice System.
  - 2) ERICO-Pentair, Lenton Form Saver.
- 3. Couplers: Threaded reinforcing bar splice:
  - a. Steel sleeve butt splice with tapered internal threads at each end for joining to matching tapered male threads on reinforcing bars.
  - b. Holding current Evaluation Report demonstrating acceptance under ICC-ES AC133.
  - c. Manufacturers: One of the following, or equal:
    - 1) Dayton Superior: Taper-Lock System.
    - 2) ERICO-Pentair: Lenton Taper Threaded Splicing System.
- 4. Couplers: Threaded All thread rod to reinforcing bar:
  - a. Steel sleeve butt splice with tapered internal threads on one end for joining to matching tapered male threads on reinforcing bars, and straight internal threads at opposite end for joining to matching straight male threads on all-thread rods.
  - b. Holding current Evaluation Report demonstrating acceptance under ICC-ES AC133.
  - c. Manufacturers: The following or equal:
    - 1) ERICO-Pentair, Lenton Bolt Coupler S4 or S5 Series.
- 5. End anchors
  - **a**. Headed steel disc with tapered internal female threads for joining to matching tapered male threads on reinforcing bars.
  - b. Holding current Evaluation Report demonstrating acceptance under ICC-ES AC347.
  - c. Manufacturers: One of the following or equal:
    - 1) Dayton Superior, Taper-Lock End Anchor Disc.
    - 2) ERICO-Pentair, Inc., Lenton Terminator.

# 2.02 FABRICATION

- A. Shop fabrication and assembly:
  - 1. Cut and bend bars in accordance with provisions of ACI 318 and the CRSI Manual of Standard Practice.
  - 2. Bend bars cold. Use bending collars to develop the recommended bend radius.
  - 3. Provide bars free from defects and kinks and from bends not indicated on the Drawings.
  - 4. Circumferential and radiused reinforcement: Roll to the radius required for its location in the structure before installation.
  - 5. Bars to be fitted with mechanical couplers[ or mechanical end anchors:
    - a. Fabricate threaded ends for connections in shop using manufacturer's recommended tools. Field fabrication is not allowed.
    - b. Cut ends square.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verification of conditions:
  - 1. Reinforcing bars and welded wire reinforcement:
    - a. Verify that reinforcement is new stock, free from rust scale, loose mill scale, excessive rust, dirt, oil, and other coatings that will adversely affect bonding capacity when placed in the Work.
  - 2. Welded wire fabric:
    - a. Verify that sheets are not curled or kinked before or after installation.

#### 3.02 PREPARATION

- A. Surface preparation:
  - 1. Reinforcing bars uncoated:
    - a. Clean reinforcement of concrete, dirt, oil and other coatings that will adversely affect bond before embedding bars in subsequent concrete placements.
    - b. Thin coating of red rust resulting from short exposure will not be considered objectionable. Thoroughly clean bars having rust scale, loose mill scale, or thick rust coat.
    - c. Partially embedded reinforcement: Remove concrete or other deleterious coatings from dowels and other projecting bars by wire brushing or sandblasting before bars are embedded in subsequent concrete placements.

## 3.03 INSTALLATION

- A. Reinforcing bars: General:
  - 1. Field-cutting of reinforcing bars is not permitted.
  - 2. Field-bending of reinforcing bars, including straightening and rebending, is not permitted.
- B. Placing reinforcing bars:
  - 1. Accurately place bars to meet position and cover requirements indicated on the Drawings and specified. Secure bars in position.
  - 2. Tolerances for placement and minimum concrete cover: As listed in Table 1.

Table 1 - Reinforcement Placing Tolerances			
Member	Tolerance on Reinforcement Location <sup>(1)</sup>	Tolerance on Minimum Concrete Cover <sup>(1,2)</sup>	
Slabs, beams, walls and columns except as noted below:			
10 inches thick and less	$\pm$ 3/8 inch	- 3/8 inch	
More than 10 inches thick	$\pm 1/2$ inch	- 1/2 inch	
Formed soffits:	As noted above	- 1/4 inch	
Longitudinal location of bends and ends of reinforcement:			
Conditions not listed below:	$\pm 2$ inches	- 1/2 inch	

Table 1 - Reinforcement Placing Tolerances			
Member	Tolerance on Reinforcement Location <sup>(1)</sup>	Tolerance on Minimum Concrete Cover <sup>(1,2)</sup>	
At discontinuous ends of brackets and corbels	$\pm 1/2$ inch	- 1/4 inch	
At discontinuous ends of other members:	$\pm 1$ inch	- 1/2 inch	

Notes:

(1) + indicates "plus or minus;" - indicates "minus;" + indicates "plus."

(2) Tolerance on cover is limited as noted, but decrease in cover shall not exceed one third of the minimum cover indicated on the Drawings.

- 3. Spacing between bars:
  - a. Minimum clear spacing between bars in a layer:
    - 1) As indicated on the Drawings, but not less than the larger of 1.5 times the bar diameter or 1-1/2 inches.
  - b. Minimum clear spacing between bars in 2 or more parallel layers:
    - 1) Place bars in upper layers directly above bars in lower layers.
    - 2) Minimum spacing between layers: As indicated on the Drawings, but not less than the larger of 1.5 times the bar diameter or 1-1/2 inches.
  - c. Limits on minimum clear spacing between bars also applies to the clear spacing between a lap splice and the adjacent bars and/or lap splices.
- 4. Lap splices for bars:
  - a. Lap splice locations and lap splice lengths: as indicated on the Drawings. Where lap lengths are not indicated, provide in accordance with ACI 318.
  - b. Unless otherwise specifically indicated on the Drawings (and noted as "noncontact lap splice"), install bars at lap splices in contact with each other and fasten together with tie wire.
  - c. Where bars are to be lap spliced at concrete joints, ensure that bars project from the first concrete placement a length equal to or greater than minimum lap splice length indicated on the Drawings.
  - d. Stagger lap splices where indicated on the Drawings.
  - e. Where lap splice lengths are not indicated on the Drawings, provide lap splice lengths in accordance with ACI 318.
- C. Reinforcing supports:
  - 1. Provide supports of sufficient numbers, sizes, and locations to maintain concrete cover, to prevent sagging and shifting, and to support loads during construction without displacement and without gouging or indentation into forming surfaces.
    - a. Quantities and locations of supports shall not be less than those indicated in ACI SP-66 and the CRSI Manual of Standard Practice.
  - 2. Do not use brick, concrete masonry units, concrete spalls, rocks, wood, or similar materials for supporting reinforcement.
  - 3. Do not use "give away bars" that have less cover than that required by the Contract Documents. Do not adjust the location of reinforcement required by the Contract Documents to provide cover for give away bars.
  - 4. Provide bar supports of height required to maintain the clear concrete cover indicated on the Drawings.

- 5. Provide bar supports at formed vertical faces to maintain the clear concrete cover indicated on the Drawings.
- 6. Schedule of reinforcement support materials: Provide bar supports as indicated in Table 2.

Table 2 - Reinforcement Support Materials			
Case	Location	Material	
a.	Concrete placed over earth and concrete seal slabs ("mud mats"):	Stainless steel wire supports on stainless steel plates.	
b.	Concrete placed against forms and exposed to water or wastewater process liquids (whether or not such concrete received additional linings or coatings):	All stainless steel bar supports.	
с.	Concrete placed against forms and exposed to earth, weather, frequent washdown, or groundwater in the finished work	Stainless steel protected bar supports.	
d.	Concrete placed against forms and exposed to interior equipment/piping areas in the finished work	Stainless steel protected bars supports.	
e.	Between mats of reinforcement, and fully embedded within a concrete member	Bright basic wire bars supports, or deformed steel reinforcing bars.	

## D. Tying of reinforcing:

- 1. Fasten reinforcement securely in place with wire ties.
- 2. Tie reinforcement at spacings sufficient to prevent shifting.
  - a. Provide at least 3 ties in each bar length. This Does not apply to dowel lap splices or to bars shorter than 4 feet, unless approved.
- 3. Tie slab bars at every intersection around perimeter of slab.
- 4. Tie wall bars and slab bar intersections other than around perimeter at not less than every fourth intersection, but at not more than the spacing indicated in Table 3:

Table 3 - Maximum Spacing of Tie Wires for Reinforcement			
Bar Size	Slab Bar Spacing Inches	Wall Bar Spacing Inches	
Bars Number 5 and Smaller	60	48	
Bars Number 6 through Number 9	96	60	
Bars Number 10 and Number 11	120	96	

- 5. After tying:
  - a. Bend ends of wires inward towards the center of the concrete section. Minimum concrete cover for tie wires shall be the same as cover requirements for reinforcement.
  - b. Remove tie wire clippings from inside forms before placing concrete.
- E. Welding reinforcing bars:
  - 1. Weld reinforcing bars only where indicated on the Drawings or where acceptance is received from Engineer prior to welding.
  - 2. Perform welding in accordance with AWS D1.4 and welding procedures accepted by Engineer.

- a. Conform to requirements for minimum preheat and interpass temperatures.
- 3. Submit:
  - a. Welding procedures specification.
  - b. Procedures qualification record.
  - c. Welder qualification test record.
- 4. Do not tack weld reinforcing bars except where specifically indicated on the Drawings.
- 5. Lenton Mechanical Splices:
  - a. Lenton mechanical splices shall be used where indicated.
  - b. The Lenton mechanical splices shall develop in tension and compression at least 125% of the yield strength (Fy) of the bar spliced.
  - c. Lenton mechanical splices shall be positive locking, taper threaded type coupler.
- F. Reinforcing bar mechanical couplers and end anchors:
  - 1. Install only at locations indicated on the Drawings or where prior approval has been obtained from Engineer.
  - 2. Install in accordance with manufacturer's instructions and requirements of Evaluation Report.
    - a. Make splices using manufacturer's standard equipment, jigs, clamps, and other required accessories.
    - b. After assembly of the splice, tighten using torque load not less than that recommended by the manufacturer.
  - 3. Unless greater cover is indicated on the Drawings, provide clear cover from surface of concrete to outside face of couplers that is not less than the minimum concrete cover specified for typical reinforcement.
    - **a**. If cover is less than required, contact Engineer for evaluation of conditions before modifying locations of bars or placing concrete.
    - b. Modifications to maintain or provide required concrete cover, such as addition of concrete ; re-positioning of stirrups, ties, etc., may be completed only after approval by Engineer.

#### 3.04 FIELD QUALITY CONTROL

- A. Provide quality control for the Work of this Section as specified in Division 1 Quality Requirements.
- B. Field inspections and testing:
  - 1. Submit records of inspections and testing to Engineer in electronic format within 24 hours after completion.
- C. Manufacturer's services:
  - 1. Furnish manufacturer's technical representative to conduct jobsite training regarding proper storage, handling, and installation of mechanical reinforcing bar couplers and bar end anchors for personnel who will perform the installation. Engineer may attend training session.

#### 3.05 FIELD QUALITY ASSURANCE

- A. Provide quality assurance as specified in contractor QA/QC Requirements.
- B. Special inspections and tests:
  - 1. Provide as specified in contractor QA/QC Special Tests and Inspections.
  - 2. Frequency of inspections:

- a. Unless otherwise indicated on the Drawings or in this Section, provide periodic special inspection as required by the Building Code specified in contractor QA/QC Regulatory Requirements.
- 3. Preparation:
  - a. Review Drawings and Specification for the Work to be observed.
  - b. Review approved submittal sand shop drawings.
- 4. Inspections: Special inspection shall include, but is not limited to, the following items.
  - a. Reinforcement: General:
    - 1) Type (material) and location of reinforcement supports.
      - 2) Bar material/steel grade and bar size.
      - 3) Location, placement, and spacing of bars.
      - 4) Clear concrete cover over reinforcement.
      - 5) Lap splice: Location and lap length. Bars within tolerances for contact unless non-contact splice is indicated on the Drawings.
      - 6) Bar hooks and development lengths embedded within concrete sections as indicated on the Drawings.
      - 7) Reinforcement tired in position and tie wire legs turned inward toward the center of the concrete section.
  - b. Reinforcement: Welding:
    - 1) Inspector qualification and inspections shall be in accordance with the requirements of AWS D1.4.
    - 2) Provide periodic inspection for:
      - a) Weldability of reinforcement other than ASTM A706.
      - b) Single pass fillet welds with thickness less than or equal to 5/16 inch.
    - 3) Provide continuous inspection for:
      - a) Other welds.
      - b) Welds at mechanical reinforcing bar couplers and end anchors.
    - 4) In addition to visual inspection, Owner may inspect reinforcing bar welds by other methods, including radiographic inspection.
- 5. Mechanical reinforcing bar couplers and end anchors.
  - a. Special inspection shall include, but is not limited to, the following items:
    - 1) Coupler and end anchor model and identification.
    - 2) Couplers and end anchors are installed in accordance with the requirements of the Engineering Report for each product.
    - **3)** Confirmation of the following:
      - a) Grade and size of reinforcing bars.
      - b) Positon of couplers[ and end anchors.
      - c) Insertion length of reinforcement.
      - d) Tightening of bars in the couplers and end anchors.
- 6. Records of inspections:
  - a. Provide a written record of each inspection using forms acceptable to the Engineer and to the Building Official.
  - b. Submit electronic copies of inspection reports to Engineer within 24 hours after completion of inspections.

## 3.06 NON-CONFORMING WORK

A. Before placing concrete, adjust or remove and re-install reinforcement to conform to the requirements of the Contract Documents.

# END OF SECTION

## SECTION 03260 ADHESIVE-BONDED REINFORCING BARS AND ALL THREAD RODS IN CONCRETE

PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes: Bonding reinforcing bars and all thread rods in concrete using adhesives.

#### 1.02 REFERENCES

- A. American Concrete Institute (ACI).
  - 1. 355.4 Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary.
- B. American National Standards Institute (ANSI):
  - 1. Standard B212.15 Carbide Tipped Masonry Drills and Blanks for Carbide Tipped Masonry Drills.
- C. ASTM international (ASTM):
  1. C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- D. Concrete Reinforcing Steel Institute (CRSI).
- E. ICC Evaluation Service, Inc. (ICCES):
  - 1. AC308 Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- F. Society for Protective Coatings (SSPC):1. SP1 Solvent Cleaning.

#### 1.03 DEFINITIONS

A. Evaluation Report: Report prepared by ICCES, or other testing agency acceptable to Engineer and to the Building Official, that documents testing and review of a product to confirm that it complies with the requirements of designated ICCES Acceptance Criteria, and to document its acceptance for use under the Building Code specified in Section contractor QA/QC Regulatory Requirements.

## 1.04 SUBMITTALS

- A. Product Data: Technical data for adhesives, including:
  - 1. Manufacturer's printed installation instructions (MPII).
  - 2. Independent laboratory test results indicating allowable loads in tension and shear for concrete of the types included in this Work, with load modification factors for temperature, spacing, edge distance, and other installation variables.
  - 3. Handling and storage instructions.
- B. Quality control submittals:
  - 1. Special inspection: Detailed step-by-step instructions for the special inspection procedures required by the building code specified in Division 1.

- 2. For each adhesive to be used, Evaluation Report confirming that the product complies with the requirements of AC308 for both uncracked and cracked concrete and for use in Seismic Design Categories A through F.
- 3. Installer qualifications:
  - a. Submit evidence of successful completion of adhesive manufacturer's installation training program.
  - b. Submit evidence of current certification for installation of inclined and overhead anchors under sustained tension loading.
- C. Inspection and testing reports:
  - 1. Inspections: Field quality control: Reports of inspections and tests.
    - a. Inspections: Field quality assurance: Reports of special inspections and tests.

## 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installation requirements:
    - a. Have available at the site, and install anchors in accordance with, the adhesive manufacturer's printed installation instructions.
  - 2. Installer qualifications:
    - a. Demonstrating successful completion of adhesive manufacturer's onsite training program for installation of adhesive-bonded anchors.
    - b. Holding current certification for installation of adhesive-bonded anchors by a qualified organization acceptable to the Engineer and to the Building Official.
      - 1) Organizations/certification programs deemed to be qualified are:
        - a) ACICRSI Adhesive Anchor Installer Certification Program.
        - b) Adhesive anchor manufacturer's certification program, subject to acceptance by the Engineer and the Building Official.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect products as follows, unless more restrictive requirements are recommended by the manufacturer:
  - 1. Store adhesives and adhesive components on pallets or shelving in a covered storage area protected from weather.
  - 2. Control temperature to maintain storage within manufacturer's recommended temperature range.
    - a. If products have been stored at temperatures outside manufacturer's recommended range, test by methods acceptable to the Engineer to confirm acceptability before installing in the Work.
  - 3. Dispose of products that have passed their expiration date.

## PART 2 PRODUCTS

## 2.01 GENERAL

- A. Like items of materials: Use end products of one manufacturer in order to achieve structural compatibility and singular responsibility.
- B. Adhesives shall have a current Evaluation Report documenting testing and compliance with the requirements or ACI 355.4 and of ICCES AC308 for use with uncracked concrete and with cracked concrete in the Seismic Design Category specified.

C. Bond reinforcing bars and all thread rods in concrete using epoxy adhesive unless other adhesives specified are specifically indicated on the Drawings or approved in writing by the Engineer.

## 2.02 EPOXY ADHESIVE

- A. Materials:
  - 1. Meeting the physical requirements of ASTM C881, Type IV, Grade 3, Class B or C depending on site conditions.
  - 2. 2component, 100 percent solids, insensitive to moisture.
  - 3. Cure temperature, pot life, and workability: Compatible with intended use and environmental conditions.
- B. Packaging:
  - 1. Disposable, self-contained cartridge system furnished in side-by-side cartridges designed to fit into a manually or pneumatically operated caulking gun, and with resin and hardener components isolated until mixing through manufacturer's static mixing nozzle.
    - a. Nozzle designed to dispense components in the proper ratio and to thoroughly blend the components for injection from the nozzle directly into prepared hole.
    - b. Provide nozzle extensions as required to allow full-depth insertion and filing from the bottom of the hole.
  - 2. Container markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
- C. Manufacturers: One of the following or equal:
  - 1. Hilti, Inc., HITRE 500V3.
  - 2. Powers Fasteners, Inc., Powers Pure110+.
  - 3. Simpson StrongTie Co., Inc., SETXP.

#### 2.03 ACRYLIC AND HYBRID ADHESIVE

- A. Materials:
  - 1. 2component, high-solids, acrylic-based or hybrid acrylic and epoxy-based adhesive.
  - 2. Approved by the manufacturer for installation at substrate temperatures of 0 degrees Fahrenheit and above.
- B. Packaging:
  - 1. Disposable, self-contained cartridge system furnished in side-by-side cartridges designed to fit into a manually or pneumatically operated caulking gun, and with resin and hardener components isolated until mixing through manufacturer's static mixing nozzle. Nozzle designed to dispense components in the proper ratio and to thoroughly blend the components for injection from the nozzle directly into prepared hole.
  - 2. Container markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
- C. Manufacturers: One of the following or equal:
  - 1. Hilti, Inc., HITHY200.
  - 2. Simpson StrongTie Co., Inc., ATXP.

## 2.04 ALL THREAD RODS

A. Materials: As specified in Section 05090 Mechanical Anchoring and Fastening to Concrete and Masonry.

### 2.05 REINFORCING BARS

A. As specified in Section 03200 Concrete Reinforcing.

#### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Execution of this work is restricted to installers who have personally completed the adhesive manufacturer's onsite training for the products to be installed, and who are personally certified through a qualified certification program described under Quality Assurance and accepted by the Engineer and the Building Official.
  - 1. Do not install holes or adhesive until training is complete.
- B. Perform work in strict compliance with the accepted MPII and the following instructions. Where the accepted MPII and the instructions conflict, the MPII shall prevail.
- C. Install reinforcing bars and all thread rods to embedment depth, and at spacing and locations indicated on the Drawings.
  - 1. If embedment depth is not indicated, contact Engineer for requirements.
  - 2. Do not install adhesive-bonded all thread rods or reinforcing bars in upwardly inclined or overhead applications unless accepted in advance by Engineer.

#### 3.02 PREPARATION

- A. Do not begin installation of adhesive bonded anchors until:
  - 1. Concrete has achieved an age of at least 21 days after placement.
  - 2. Onsite training in installation of adhesive bonded anchors by manufacturer's technical representative is complete. Do not drill holes in concrete or install adhesive and embeds in holes.
- B. Review manufacturer's printed installation instructions (MPII) and "conditions of use" stipulated in the Evaluation Report before beginning work.
  - 1. Bring to the attention of the adhesive manufacturer's technical representative any discrepancies between these documents, and resolve before proceeding with installation.
- C. Install adhesive bonded anchors in full compliance with manufacturer's printed installation instructions using personnel who have successfully completed manufacturer's onsite training for products to be used and who hold certifications specified in this Section.
- D. Confirm that adhesive and substrate receiving adhesive are within manufacturer's recommended range for temperature and moisture conditions, and will remain so during the curing time for the product.

## 3.03 HOLE SIZING AND INSTALLATION

- A. Drilling holes:
  - 1. Determine location of reinforcing bars or other obstructions with a nondestructive indicator device, and mark locations with construction crayon on the surface of the concrete.
  - 2. Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without prior acceptance by Engineer.
- B. Hole drilling equipment:
  - 1. Electric or pneumatic rotary impact type with medium or light impact.
    - a. Installation of anchors in cored holes is not permitted.
    - b. Set drill to "rotation only" mode, or to "rotation plus hammer" mode in accordance with the manufacturer's installation instructions and the requirements of the Evaluation Report.
    - c. Where edge distances are less than 2 inches and "rotation plus hammer" mode is permitted, use lighter impact equipment to prevent microcracking and concrete spalling during the drilling process.
  - 2. Drill bits: Carbide-tipped in accordance with ANSI B21215 unless otherwise recommended by the manufacturer or required as a "condition of use" in the Evaluation Report.
    - a. Hollow drill bits with flushing air systems are preferred. Air supplied to hollow drill bits shall be free of oil, water, or other contaminants that will reduce bond.
- C. Hole diameter: As recommended in the manufacturer's installation instructions and the Evaluation Report.
- D. Hole depth: As recommended in the manufacturer's installation instructions to provide minimum effective embedment indicated on the Drawings.
- E. Obstructions in drill path:
  - 1. If an existing reinforcing bar or other obstruction is hit while drilling a hole, unless otherwise accepted by Engineer, stop drilling. Prepare and fill the hole with dry pack mortar. Relocate the hole to miss the obstruction and drill another hole to the required depth.
    - a. Obtain Engineer's acceptance of distance between abandoned and relocated holes before proceeding with the relocation.
    - b. Allow dry pack mortar to cure to a strength equal to that of the surrounding concrete before resuming drilling in the area.
    - c. Epoxy grout may be substituted for dry pack mortar when accepted by Engineer.
  - 2. Avoid drilling an excessive number of holes in an area of a structural member, which would excessively weaken the member and endanger the stability of the structure.
  - 3. When existing reinforcing steel is encountered during drilling and when specifically accepted by Engineer, enlarge the hole by 1/8 inch, core through the existing reinforcing steel at the larger diameter, and resume drilling at original hole diameter using pneumatic rotary impact drill.
  - 4. Bent bar reinforcing bars: Where edge distances are critical, and interference with existing reinforcing steel is likely, if acceptable to Engineer, drill hole at 10 degree (or less) angle from axis of reinforcing bar or all thread rod being installed.
- F. Cleaning holes:
  - 1. Insert air nozzle to bottom of hole and blow out loose dust.

- a. Use compressed air that is free of oil, water, or other contaminants that will reduce bond.
- b. Provide minimum air pressure of 90 pounds per square inch for not less than 4 seconds.
- 2. Using a stiff bristle brush with diameter that provides contact around the full perimeter of the hole, vigorously brush hole to dislodge compacted drilling dust.
  - a. Insert brush to the bottom of the hole and withdraw using a simultaneous twisting motion.
  - b. Repeat at least 4 times.
- 3. Repeat the preceding steps as required to remove drilling dust or other material that will reduce bond, and in the number of cycles required by the MPII and the Evaluation Report.
- 4. Leave prepared holes clean and dry.
- 5. Protect prepared and cleaned holes from contamination and moisture until adhesive is installed.
- 6. Reclean and dry previously prepared holes if, in the opinion of the Engineer, the hole has become contaminated after initial cleaning.

## 3.04 INSTALLATION OF ADHESIVE AND INSERTS

- A. Clean and prepare inserts reinforcing bars and all thread rods:
  - 1. Prepare embedded length of reinforcing bars and all thread rods by cleaning to bare metal. Inserts shall be free of oil, grease, paint, dirt, mill scale, rust, or other coatings that will reduce bond.
  - 2. Solvent clean prepared reinforcing bars and all thread rods over the embedment length in accordance with SSPC SP1. Provide an oil and grease free surface for bonding of adhesive to steel.
- B. Fill holes with adhesive:
  - 1. Starting at the bottom of the hole, fill hole with adhesive inserting the reinforcing bar or all thread rod.
  - 2. Fill hole as nozzle is withdrawn without creating air voids.
  - 3. Unless otherwise indicated on the Drawings, fill hole with sufficient adhesive so that excess adhesive is extruded out of the hole when the reinforcing bar or all thread rod is inserted.
  - 4. Where necessary, seal hole at surface of concrete to prevent loss of adhesive during curing.
- C. Installing reinforcing bars and all thread rods.
  - 1. Unless otherwise indicated on the Drawings, install bars and rods perpendicular to the concrete surface.
  - 2. Insert reinforcing bars and all thread rods into adhesive in accordance with manufacturer's recommended procedures.
  - 3. Confirm that insert has reached the designated embedment in the concrete, and that adhesive completely surrounds the embedded portion.
  - 4. Securely brace bars and all thread rods in place to prevent displacement while the adhesive cures. Bars and rods displaced during curing will be considered damaged and replacement will be required.
  - 5. Clean excess adhesive from the mouth of the hole.
- D. Curing and loading.

- 1. Provide and maintain curing conditions recommended by the adhesive manufacturer for the period required to fully cure the adhesive at the temperature of the concrete.
- 2. Do not disturb or load bonded embeds until manufacturer's recommended cure time, based on temperature of the concrete, has elapsed.

## 3.05 POSTINSTALLATION ACTIVITIES

- A. Do not bend bars or all-thread rods after bonding to the concrete, unless accepted in advance by the Engineer.
- B. Attachments to all thread rods:
  - 1. After assemblies to be connected are placed, install nuts and washers for threaded rods as indicated on the Drawings.

### 3.06 FIELD QUALITY CONTROL

- A. Provide field quality control over the Work of this Section as specified in Division 1.
- B. Do not allow work described in this Section to be performed by individuals who do not hold the specified certifications and who have not completed the specified job site training.
- C. Manufacturer's services:
  - 1. Before beginning installation, furnish adhesive manufacturer's technical representative to conduct onsite training in proper storage and handling of adhesive, drilling and cleaning of holes, and preparation and installation of reinforcing bars and all thread rods.
    - a. Provide notice of scheduled training to Engineer and to Special Inspector(s) not less than 10 working days before training occurs. Engineer and Special Inspector may attend training sessions.
  - 2. Submit record, signed by the manufacturer's technical representative, listing Contractor's personnel who completed the training. Only qualified personnel who have completed manufacturer's onsite training shall perform installations.
- D. Field inspections and testing:
  - 1. Hole drilling and preparation.
  - 2. Results: Submit records of inspections and testing to Engineer by electronic copies within 24 hours after completion.

## 3.07 FIELD QUALITY ASSURANCE

- A. Provide field quality assurance over the Work of this Section as specified in Division 1.
- B. Special inspections, special tests, and structural observation:
  - 1. Provide as specified in Division 1 Special Tests and Inspections.
  - 2. Frequency of inspections:
    - **a**. Unless otherwise indicated on the Drawings or in this Section, provide periodic special inspection as required by the Evaluation Report for the product installed.
    - b. Provide continuous inspection for the initial installation of each type and size of adhesive bonded reinforcing bar and all thread rod. Subsequent installations of the same anchor may be installed with periodic inspection as defined in subsequent paragraphs.
    - c. Provide continuous inspection of all drilling, cleaning and bonding activities for bars and rods, installed in horizontal, an upwardly inclined positions.

- 3. Preparation:
  - a. Review Drawings and Specifications for the Work to be observed.
  - b. Review adhesive manufacturer's MPII and recommended installation procedures.
  - c. Review Evaluation Report "Conditions of Use" and "Special Inspection" requirements.
- 4. Inspection: Periodic:
  - a. Initial inspection. Provide an initial inspection for each combination of concrete and reinforcing bar strength or concrete strength and all thread rod material being installed. During initial inspection, observe the following for compliance with the installation requirements.
    - 1) Concrete: Class (minimum specified compressive strength) and thickness.
    - 2) Environment: Temperature conditions at work area, and moisture conditions of concrete and drilled hole.
    - 3) Holes: Locations, spacing, and edge distances; verification of drill bit compliance with requirements; cleaning equipment and procedures; cleanliness of hole. Before adhesive is placed, confirm that depth and preparation of holes conforms to the requirements of the Contract Documents, the MPII, and the "conditions of use" listed in the Evaluation Report.
    - 4) Adhesive: Product manufacturer and name; lot number and expiration date; temperature of product at installation; installation procedure. Note initial set times observed during installation.
    - 5) Reinforcing bars and all thread rods: Material diameter and length; steel grade and/or strength; cleaning and preparation; cleanliness at insertion; minimum effective embedment provided.
  - b. Subsequent inspections: Subsequent installations of the same reinforcing bars or all thread rods may be performed without the presence of the special inspector, provided that:
    - 1) There is no change in personnel performing the installation, the general strength and characteristics of the concrete receiving the inserts, or the reinforcing bars and all thread rods being used.
    - 2) For ongoing installations, the special inspector visits the site at least once per day during each day of installation to observe the work for compliance with material requirements and installation procedures.
- 5. Inspection: Continuous.
  - a. Make observations as described under "Inspection Periodic, Initial Inspection" during all drilling, cleaning, and bonding activities for all bars and rods installed.
- 6. Records of inspections:
  - a. Provide a written record of each inspection using forms acceptable to the Engineer and to the Building Official.
  - b. Submit electronic copies of inspection reports to Engineer within 24 hours after completion of inspection.

# END OF SECTION

## SECTION 03300 CAST-IN-PLACE CONCRETE

## PART 1 GENERAL

#### 1.01 SUMMARY

A. Section includes: Cast-in-place concrete.

#### 1.02 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. 305 Hot Weather Concreting Standard.
  - 2. 306 Cold Weather Concreting Standard.
  - 3. 318 Building Code Requirements for Structural Concrete and Commentary.
  - 4. 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary.
  - 5. Manual of Concrete Practice.
- B. ASTM International (ASTM):
  - 1. C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.
  - 2. C33 Standard Specification for Concrete Aggregates.
  - 3. C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  - 4. C40 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
  - 5. C42 Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
  - 6. C88 Standard Test Method of Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
  - 7. C94 Standard Specification for Ready-Mixed Concrete.
  - 8. C114 Standard Test Methods for Chemical Analysis of Hydraulic Cement.
  - 9. C117 Standard Test Method for Materials Finer that 75-m (No. 200) Sieve in Mineral Aggregates by Washing.
  - 10. C123 Standard Test Method for Lightweight Particles in Aggregate.
  - 11. C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - 12. C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 13. C142 Standard Test Method for Clay Lumps and Friable Particles in Aggregate.
  - 14. C143 Standard Test Method for Slump of Hydraulic-Cement Concrete.
  - 15. C150 Standard Specification for Portland Cement.
  - 16. C156 Standard Test Method for Water Loss Through Liquid Membrane-Forming Curing Compounds for Concrete.
  - 17. C171 Standard Specifications for Sheet Materials for Curing Concrete.
  - 18. C172 Standard Practice for Sampling Freshly Mixed Concrete.
  - 19. C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
  - 20. C227 Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
  - 21. C260 Standard Specification for Air-Entraining Admixtures for Concrete.
  - 22. C295 Standard Guide to Petrographic Examination of Aggregates for Concrete.
  - 23. C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

- 24. C311 Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete.
- 25. C469 Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.
- 26. C494 Standard Specification for Chemical Admixtures for Concrete.
- 27. C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- 28. C856 Standard Practice for Petrographic Examination of Hardened Concrete.
- 29. C1260 Standard Test Method of Potential Alkali Reactivity of Aggregates (Mortar Bar Method).
- 30. C1293 Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
- 31. D75 Standard Practice for Sampling Aggregates.
- 32. D2103 Standard Specification for Polyethylene Film and Sheeting.

### 1.03 DEFINITIONS

- A. Alkali: Sum of sodium oxide and potassium oxide calculated as sodium oxide.
- B. Cementitious materials: Portland cement.
- C. Cold weather: A period when for more than 3 consecutive days, the average daily outdoor temperature drops below 40 degrees Fahrenheit. The average daily temperature is the average of the highest and lowest temperatures during the period from midnight to midnight. When temperatures above 50 degrees Fahrenheit occur during more than half of any 24-hour duration, the period shall no longer be regarded as cold weather.
- D. Cold weather concreting: Operations for placing, finishing, curing, and protection of concrete during cold weather.
- E. Green concrete: Concrete with less than 100 percent of the specified strength.
- F. Hairline crack: Crack with a crack width of less than 4 thousandths of an inch.
- G. Hot weather: A period when project conditions such as low humidity, high temperature, solar radiation, and high winds, promote rapid drying of freshly placed concrete.
- H. Hot weather concreting: Operations for placing, finishing, curing, and protection of concrete during hot weather.

#### 1.04 SYSTEM DESCRIPTION

- A. Performance requirements:
  - 1. General:
    - a. Except as otherwise specified, provide concrete composed of Portland cement, fine aggregate, coarse aggregate, admixtures and water so proportioned and mixed as to produce plastic, workable mixture in accordance with requirements as specified in this Section and suitable to specific conditions of placement.
    - b. Proportion materials in a manner that will secure lowest water-cementitious materials ratio that is consistent with good workability, plastic and cohesive mixture, and a mixture that is within specified slump range.
    - **c.** Proportion fine and coarse aggregates in manner such as not to produce harshness in placing or honeycombing.

- 2. It is the intent of this Section to secure for every part of the Work concrete with homogeneous mixture, which when hardened will have required strength, watertightness, and durability:
  - a. It is recognized that some surface hairline cracks and crazing will develop in the concrete surfaces.
  - b. Construction, contraction, and expansion joints have been specified and positioned in structures as indicated on the Drawings or required, and curing methods specified, for purpose of reducing number and size of cracks, due to normal expansion and contraction expected from specified concrete mixes.
  - c. Repair cracks which develop in walls or slabs and repair cracks which show any signs of leakage until all leakage is stopped.
  - d. Pressure inject visible cracks, other than hairline cracks and crazing, in following areas with epoxy as specified in Section approved Epoxy Injection System:
    - 1) Floors and walls of water bearing structures.
    - 2) Walls and overhead slabs of passageways or occupied spaces, outsides of which are exposed to weather or may be washed down and are not specified to receive separate waterproof membrane.
    - 3) Other items not specified to receive separate waterproof membrane: Slabs over water channels, wet wells, reservoirs, and other similar surfaces.
  - e. Walls or slabs, as specified above, that leak or sweat because of porosity or cracks too small for successful pressure injection with epoxy: Seal on water or weather side by coatings of surface sealant system, as specified in this Section.
  - f. Pressure injection and sealing: Continue as specified above until structure is watertight and remains watertight for not less than 1 year after final acceptance or date of final repair, whichever occurs later in time.
- 3. Workmanship and methods: Provide concrete work, including detailing of reinforcing, conforming with best standard practices and as set forth in ACI 318, ACI 350, Manual of Concrete Practices, and recommended practices.

## 1.05 SUBMITTALS

- A. Cement mill tests:
  - 1. Include alkali content representative of each shipment of cement for verification of compliance with specified requirements.
  - 2. Provide mill test reports dated not more than 90 days before the date of submittal.
- B. Cold weather concreting:
  - 1. Procedures for the production, transportation, placement, protection, curing, and temperature monitoring for concrete during cold weather.
  - 2. Procedures to be implemented upon abrupt changes in weather conditions or equipment failures.
- C. Concrete mixes: Full details, including mix design calculations for concrete mixes proposed for use for each class of concrete:
  - 1. Include information on correction of batching for varying moisture contents of fine aggregate.
  - 2. Source quality test records with mix design submittal:
    - a. Include calculations for required compressive strength (f'cr) based on source quality test records.
- D. Concrete aggregate tests: Certified copies in triplicate of commercial laboratory tests not more than 90 days old of all samples of concrete aggregates:

- 1. Coarse aggregate:
  - a. Abrasion loss.
  - b. Clay lumps and friable particles.
  - **c**. Coal and lignite.
  - d. Materials finer than 200 sieve.
  - e. Reactivity.
  - f. Shale and chert.
  - g. Soundness.
  - Fine aggregate:

2.

- a. Clay lumps.
- b. Color.
- c. Decantation.
- d. Reactivity.
- e. Shale and chert.
- f. Soundness.
- E. Fine or coarse aggregate batched from more than 1 bin: Analyses for each bin, and composite analysis made up from these, using proportions of materials to be used in mix.
- F. For conditions that promote rapid drying of freshly placed concrete such as low humidity, high temperature, and wind: Corrective measures for use prior to placing concrete.
- G. Hot weather concreting: Procedures for production, placement, finishing, curing, protection, and temperature monitoring for concrete during hot weather and appropriate corrective measures.
- H. Heating equipment for cold weather concreting: Information on type of equipment used for heating materials and new concrete in process of curing during excessively cold weather.
- I. Information on mixing equipment.
- J. Product data: Submit data completely describing products.
- K. Sequence of concrete placing: Submit proposed sequence of placing concrete showing proposed beginning and ending of individual placements.
- L. Sieve analysis: Submit sieve analyses of fine and coarse aggregates being used in triplicate at least every 3 weeks and at any time there is significant change in grading of materials.
- M. Trial batch test data:
  - 1. Submit data for each test cylinder.
  - 2. Submit data that identifies mix and slump for each test cylinder.
- N. Weather monitoring: Records of:
  - 1. Relative humidity.
  - 2. Site ambient temperature.
  - 3. Wind speed.
- O. Temperature of freshly placed concrete.

# 1.06 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- 1. Deliver, store, and handle concrete materials in manner that prevents damage and inclusion of foreign substances.
- 2. Deliver and store packaged materials in original containers until ready for use.
- 3. Deliver aggregate to mixing site and handle in such manner that variations in moisture content will not interfere with steady production of concrete of specified degree of uniformity and slump.
- B. Acceptance at site: Reject material containers or materials showing evidence of water or other damage.

#### 1.07 PROJECT CONDITIONS

- A. Environmental requirements:
  - 1. Monitoring weather conditions:
    - **a**. Measure and record temperature of fresh concrete. Furnish and use sufficient number of maximum and minimum self-recording thermometers to adequately measure temperature of concrete.
    - b. Monitor and keep records of the weather forecast starting at least 48 hours prior to placing concrete in order to allow enough time for taking appropriate measures pertaining to Hot or Cold weather concreting.
  - 2. Hot weather concreting:
    - a. Initiate evaporation control measures when concrete and air temperatures, relative humidity of the air, and the wind velocity have the capacity to evaporate water from a free surface at a rate that is equal to or greater than 0.2 pounds per square feet per hour. Determine evaporation rate using the Menzel Formula and monograph in ACI 305 3.1.3.
    - b. When ambient air temperature is above 85 degrees Fahrenheit: Prior to placing concrete, cool forms and reinforcing steel by water cooling to below 90 degrees Fahrenheit.
    - c. Monitor weather conditions at the site including air temperature, humidity, and wind speed, to assess the need for evaporation control measures begin monitoring site conditions no later than 1 hour before the start of concrete placement. Continue to monitor site conditions at intervals of 30 minutes until concrete curing has begun.
    - d. Temperature of concrete mix at time of placement: Keep temperature below 90 degrees Fahrenheit by methods which do not impair quality of concrete.
    - e. For conditions that promote rapid drying of freshly placed concrete such as low humidity, high temperature, and wind: Take corrective measures to minimize rapid water loss from concrete:
    - f. Furnish and use sufficient number of maximum and minimum self-recording thermometers to adequately measure temperature around concrete.
  - 3. Cold weather concreting:
    - a. Concrete placed below ambient air temperature of 45 degrees Fahrenheit and falling or below 40 degrees Fahrenheit:
      - 1) Make provision for heating water.
    - b. Follow recommendations of ACI 306 for preparation, placement, and protection of concrete during cold weather.
    - c. If materials have been exposed to freezing temperatures to degree that any material is below 35 degrees Fahrenheit: Heat such materials.
    - d. Heating water, cement, or aggregate materials:
      - 1) Do not heat in excess of 160 degrees Fahrenheit.
    - e. Protection of concrete in forms:

- Do not remove forms from concrete when outside ambient air temperature is below 50 degrees Fahrenheit until concrete has attained its minimum specified compressive strength. Evidence of strength shall be based on by testing of cylinders stored in the field under equivalent conditions to those at the concrete structure.
- 2) Protect by means of covering with tarpaulins, or other acceptable covering acceptable to Engineer.
- 3) Provide means for circulating warm moist air around forms in manner to maintain temperature of 50 degrees Fahrenheit for at least 5 days.

## 1.08 SEQUENCING AND SCHEDULING

A. Schedule placing of concrete in such manner as to complete any single placing operation to construction, or expansion joint.

### PART 2 PRODUCTS

## 2.01 MATERIALS

- A. Admixtures:
  - 1. General:
    - a. Do not use admixtures of any type, except as specified, unless written acceptance has been obtained from the Engineer.
    - b. Admixtures shall be compatible with concrete and other admixtures. Admixtures other than pozzolans shall be the products of a single manufacture to ensure compatibility.
    - c. Do not use admixtures containing chlorides calculated as chloride ion in excess of 0.5 percent by weight of cement.
    - d. Use in accordance with manufacturer's recommendations. Add each admixture to concrete mix separately.
  - 2. Air entraining admixture:
    - a. Provide concrete with 6 percent, within 1 percent, entrained air of evenly dispersed air bubbles at time of placement.
    - b. In accordance with ASTM C260.
  - 3. Water reducing admixture:
    - a. May be used at the Contractor's option.
    - b. In accordance with ASTM C494, Type A or Type D.
    - c. Not contain air-entraining agents.
    - d. Liquid form before adding to the concrete mix.
    - e. No decrease in cement is permitted as result of use of water reducing admixture.
  - 4. Super-plasticizers: Are not to be used without acceptance by Engineer.
- B. Aggregate:
  - 1. General:
    - a. Provide concrete aggregates that are sound, uniformly graded, and free of deleterious material in excess of allowable amounts specified.
    - b. Grade aggregate in accordance with ASTM C136 and D75.
    - c. Provide unit weight of fine and coarse aggregate that produces in place concrete with weight of not less than 140 pounds per cubic foot.
    - d. Do not use aggregate made from recycled materials such as crushed and screened hydraulic-cement concrete, brick, and other construction materials.

- 2. Fine aggregate:
  - a. Provide fine aggregate for concrete or mortar consisting of clean, natural sand or of sand prepared from crushed stone or crushed gravel.
  - b. Do not provide aggregate having deleterious substances in excess of following percentages by weight of contaminating substances.
    - 1) In no case shall total exceed percent listed.

Item	Test Method	Percent
Removed by decantation (dirt, silt, etc.)	ASTM C117	3
Shale or Chert	ASTM C123 ASTM C295*	1 1
Clay Lumps	ASTM C142	1

Test Method C123 is used to identify particles in the sample lighter than 2.40 Specific Gravity. Test Method C295 is used to identify which of the lightweight particles are shale or chert. If the results of Test Method C123 are less than 1 percent, Test Method C295 is not required.

- c. Except as otherwise specified, grade fine aggregate from coarse to fine in accordance with ASTM C33.
- 3. In accordance with NSF 61. Coarse aggregate:
  - a. Provide coarse aggregate consisting of gravel or crushed stone made up of clean, hard, durable particles free from calcareous coatings, organic matter, or other foreign substances.
  - b. Not exceeding 15 percent by weight, of thin or elongated pieces having length greater than 5 times average thickness.
  - c. In accordance with NSF 61. Deleterious substances: Not in excess of following percentages by weight, and in no case having total of all deleterious substances exceeding 2 percent.

Item	Test Method	Percent
Shale or chert	ASTM C123 ASTM C295*	1.25 1
Coal and lignite	ASTM C123	1/4
Clay lumps and friable particles	ASTM C142	1/4
Materials finer than Number 200 sieve	ASTM C117	1/2**

\* Test Method C123 is used to identify particles in the sample lighter than 2.40 Specific Gravity. Test Method C295 is used to identify which of the lightweight particles are shale, chert, coal, or lignite. If the results of Test Method C123 are less than 1.25 percent (the minimum combined percentage of shale, chert, coal and lignite), Test Method C295 is not required.

\*\* Except when material finer than Number 200 sieve consists of crusher dust, maximum amount shall be 1 percent.

- d. Grading:
  - Aggregate for Class A, B, C, and D concrete: In accordance with ASTM C33, Size Number 57, except as otherwise specified or authorized in writing by the Engineer.
  - 2) Aggregate for Class CE concrete for encasement of electrical conduits:

- a) Graded in accordance with ASTM C33, Size Number 8.
- C. Concrete sealer:
  - 1. Manufacturers: One of the following or equal:
    - a. Euclid Chemical Co., Diamond Hard.
    - b. L&M Construction Chemicals, SealHard.
- D. Conduit encasement coloring agent:
  - 1. Color: Red color concrete used for encasement of electrical ducts, conduits, and similar type items.
  - 2. Manufacturers: One of the following or equal:
    - a. Davis Co., #100 Utility Red.
    - b. I. Reiss Co., Inc., equivalent product.
    - c. Euclid Chemical Co., Increte Division, "Colorcrete Brick Red."
  - 3. Conduit encasement concrete: Mix into each cubic yard of concrete 10 pounds of coloring agent.
- E. Evaporation retardant:
  - 1. Manufacturers: One of the following or equal:
    - a. BASF, Confilm.
    - b. Euclid Chemical Co., Eucobar.
- F. Fly ash:
  - 1. No fly ash is permitted to be used in this project.
- G. Keyway material: Steel, plastic, or lumber.
- H. Nonslip abrasive:
  - 1. Aluminum oxide abrasive size 8/16, having structure of hard aggregate that is, homogenous, nonglazing, rustproof, and unaffected by freezing, moisture, or cleaning compounds.(used on stairs and ramps)
  - 2. Manufacturers: One of the following or equal:
    - a. Exolon Co.
    - b. Abrasive Materials, Inc.
    - c. Euclid Chemical Co., "Non-Slip Aggregate".
- I. Portland cement:
  - 1. Conform to specifications and tests in accordance with ASTM C150, Types II or III, low alkali, except as specified otherwise.
  - 2. Have total alkali containing not more than 0.60 percent.
  - 3. Exposed concrete in any individual structure: Use only one brand of portland cement.
  - 4. Cement for finishes or repairs: Provide cement from same source and of same type as concrete to be finished or repaired.
  - 5. In accordance with NSF 61.
- J. Sheet membrane for curing:
  - 1. Polyethylene film:
    - a. In accordance with ASTM C171.
    - b. Color: White.
    - c. Thickness: Nominal thickness of polyethylene film shall not be less than 0.0040 inches when measured in accordance with ASTM D2103. Thickness of polyethylene film at any point shall not be less than 0.0030 inches.

- d. Loss of moisture: Not exceed 0.055 grams per square centimeter of surface when tested in accordance with ASTM C156.
- K. Sprayed membrane curing compound: Clear type with fugitive dye in accordance with ASTM C309, Type 1D.
- L. Surface sealant system:
  - 1. In accordance with NSF-61.
  - 2. Manufacturers: One of the following or equal:
    - a. Euclid Chemical Co., Vandex Super.
    - b. Kryton International, Inc., Krystol T1.
    - c. Xypex Chemical Corp., Xypex Concentrate.
- M. Water:
  - 1. Water for concrete, washing aggregate, and curing concrete: Clean and free from oil and deleterious amounts of alkali, acid, organic matter, or other substances.
  - 2. Chlorides and sulfate ions:
    - a. Water for conventional reinforced concrete: Use water containing not more than 1,000 milligrams per liter of chlorides calculated as chloride ion, nor more than 1,000 milligrams per liter of sulfates calculated as sulfate ion.
    - b. Water for prestressed or post-tensioned concrete: Use water containing not more than 650 milligrams per liter of chlorides calculated as chloride ion, or more than 800 milligrams per liter of sulfates calculated as sulfate ion.

## 2.02 EQUIPMENT

- A. Mixing concrete:
  - 1. Mixers may be of stationary plant, paver, or truck mixer type.
  - 2. Provide adequate equipment and facilities for accurate measurement and control of materials and for readily changing proportions of material.
  - 3. Mixing equipment:
    - a. Capable of combining aggregates, cementitious materials, and water within specified time into thoroughly mixed and uniform mass and discharging mixture without segregation.
    - b. Maintain concrete mixing plant and equipment in good working order and operated at loads, speeds, and timing recommended by manufacturer or as specified.
    - c. Proportion cementitious materials and aggregate by weight.
- B. Machine mixing:
  - 1. Batch plant shall be capable of controlling delivery of all material to mixer within 1 percent by weight of individual material.
  - 2. If bulk cementitious materials are used, weigh them on separate visible scale which will accurately register scale load at any stage of weighing operation from zero to full capacity.
  - 3. Prevent cementitious materials from coming into contact with aggregate or with water until materials are in mixer ready for complete mixing with all mixing water.
  - 4. Procedure of mixing cementitious materials with sand or with sand and coarse aggregate for delivery to project site, for final mixing and addition of mixing water will not be permitted.
  - 5. Retempering of concrete will not be permitted.
  - 6. Discharge entire batch before recharging.
- 7. Volume of mixed material per batch: Not exceed manufacturer's rated capacity of mixer.
- 8. Mixers:
  - a. Perform mixing in batch mixers of acceptable type.
  - b. Equip each mixer with device for accurately measuring and indicating quantity of water entering concrete, and operating mechanism such that leakage will not occur when valves are closed.
  - c. Equip each mixer with device for automatically measuring, indicating, and controlling time required for mixing:
    - 1) Interlock device to prevent discharge of concrete from mixer before expiration of mixing period.
- C. Transit-mixed concrete:
  - 1. Mix and deliver in accordance with ASTM C94.
  - 2. Total elapsed time between addition of water at batch plant and discharging completed mix:
    - a. Not to exceed 90 minutes.
    - b. Elapsed time at project site shall not exceed 30 minutes.
  - 3. Under conditions contributing to quick setting, total elapsed time permitted may be reduced by the Engineer.
  - 4. Equip each truck mixer with device interlocked to prevent discharge of concrete from drum before required number of turns and furnish device that is capable of counting number of revolutions of drum.
  - 5. Continuously revolve drum after it is once started until it has completely discharged its batch:
    - a. Do not add water until drum has started revolving.
    - b. Right is reserved to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. The Contractor will not be entitled to additional compensation because of such increase or decrease.
- D. Other types of mixers: In case of other types of mixers, mixing shall be as follows:
  - 1. Mix concrete until there is uniform distribution of materials, and discharge mixer completely before recharging.
  - 2. Neither speed nor volume loading of mixer shall exceed manufacturer's recommendations.
  - 3. Continue mixing for minimum of 1-1/2 minutes after all materials are in drum, and for batches larger than 1 cubic yard increase minimum mixing time 15 seconds for each additional cubic yard or fraction thereof.

# 2.03 MIXES

- A. Measurements of materials:
  - 1. Measure materials by weighing, except as otherwise specified or where other methods are specifically authorized in writing by the Engineer.
  - 2. Furnish apparatus for weighing aggregates and cementitious materials that is suitably designed and constructed for this purpose.
  - 3. Accuracy of weighing devices: Furnish devices that have capability of providing successive quantities of individual material that can be measured to within 1 percent of desired amount of that material.
  - 4. Measuring or weighing devices: Subject to review by the Engineer. Shall bear valid seal of the Sealer of Weights and Measures having jurisdiction.

- 5. Weighing cementitious materials:
  - a. Weigh cementitious materials separately.
  - b. Cement in unbroken standard packages (sacks): Need not be weighed.
  - c. Weigh bulk cementitious materials and fractional packages.
- 6. Measure mixing water by volume or by weight.
- B. Concrete proportions and consistency:
  - 1. Provide concrete that can be worked readily into corners and angles of forms and around reinforcement without excessive vibration and without permitting materials to segregate or free water to collect on surface.
  - 2. Prevent unnecessary or haphazard changes in consistency of concrete.
  - 3. Ratio of coarse aggregate to fine aggregate: Not less than 1.0 or more than 2.0 for all concrete Classes, with exception of Class CE.
  - 4. Aggregate:
    - a. Obtain aggregate from source that is capable of providing uniform quality, moisture content, and grading during any single day's operation.
  - 5. Maximum concrete mix water to cementitious materials ratio, minimum cementitious materials content, and slump range: Conform to values specified in Table A in this Section.
  - 6. Concrete batch weights: Control and adjust to secure maximum yield. At all times, maintain proportions of concrete mix within specified limits.
  - 7. Mix modification: If required, by the Engineer, modify mixture within limits set forth in this Section.
- C. Concrete mixes:
  - 1. Proportioning of concrete mix: Proportion mixes based on required compressive strength  $f_c$ .
  - 2. Mixes:
    - a. Adjusting of water: After acceptance, do not change mixes without acceptance by Engineer, except that at all times adjust batching of water to compensate for free moisture content of fine aggregate.
    - b. Total water content of each concrete class: Not exceed those specified in Table A in this Section.
    - c. Checking moisture content of fine aggregate: Furnish satisfactory means at batching plant for checking moisture content of fine aggregate.
  - 3. Change in mixes: Submit new mix design and perform new trial batch and test program as specified in this Section.
- D. Hand mixed concrete:
  - 1. Hand mix concrete only when acceptable to the Engineer.
- E. Classes of concrete:
  - 1. Provide concrete consisting of 5 classes: Classes A, B, C, D, and CE. Use where specified or indicated on the Drawings.
  - 2. Weight of concrete classes: Provide classes of concrete having minimum weight of 140 pounds per cubic foot.
  - 3. Class B concrete: Class B concrete may be substituted for Class A concrete, when high-early strength concrete is needed in areas specifically accepted by the Engineer and that do not require sulfate resistant concrete.
  - 4. Class C concrete: Class C concrete may be used for fill for unauthorized excavation, for thrust blocks and ground anchors for piping, for bedding of pipe, and where indicated on the Drawings.

- 5. Class D concrete: Use Class D for precast concrete items.
- 6. Class CE concrete: Use Class CE for electrical conduit encasements.
- 7. All other concrete, unless specified or otherwise indicated on the Drawings: Use Class A concrete.

TABLE A: CONCRETE					
Class	Minimum Specified Compressive Strength f <sup>c</sup> at 28 Days (Pounds per Square Inch)	Water-to- Cementitious Materials Ratio	Cementitious Materials per Cubic Yard of Concrete by Weight (Pounds)	Slump Range (Inches)	
А	4,500	0.40 to 0.45	564 to 658	2 to 4	
B (Type III cement)	4,500	0.40 to 0.45	564 to 658	2 to 4	
С	2,500	Maximum 0.62	Minimum 423	3 to 6	
CE	2,500	Maximum 0.62	Minimum 423	3 to 6	
D	5,000	0.40 to 0.45	564 to 658	2 to 4	

- 8. Pumped concrete: Provide pumped concrete that complies with all requirements of this Section.
- 9. Do not place concrete with slump outside limits indicated in Table A.
- 10. Classes:
  - a. Classes A, C, D, and CE concrete: Make with Type II low alkali portland cement.
  - b. Class B concrete: Make with Type III low alkali portland cement.
  - c. Admixtures: Provide admixtures as specified in this Section.

# F. Air entraining admixture:

- 1. Add agent to batch in portion of mixing water.
- 2. Batch solution by means of mechanical batcher capable of accurate measurement.
- 3. Exterior Exposed Concrete.

# 2.04 SOURCE QUALITY CONTROL

# A. Tests:

- 1. Trial batches:
  - a. After concrete mix designs have been accepted by Engineer, have trial batches of the accepted Class A, Class B, and Class D concrete mix designs prepared by testing laboratory acceptable to the Engineer.
  - b. Prepare trial batches using cementitious materials and aggregates proposed to be used for the Work.
  - c. Prepare trial batches with sufficient quantity to determine slump, workability, consistency, setting time, and finishing characteristics, and to provide sufficient test cylinders.
  - d. Test cylinders: Provide cylinders having 6-inch diameter by 12-inch length and that are prepared in accordance with ASTM C31 for tests specified in this Section.
  - e. Determine slump in accordance with ASTM C143.
  - f. Test cylinders from trial batch:
    - 1) Test 8 cylinders for compressive strength in accordance with ASTM C39:
      - a) Test 4 cylinders at 7 days and 4 at 28 days.

- b) Establish ratio between 7 day and 28 day strength for mix. 7-day strength may be taken as satisfactory indication of 28-day strength provided effects on concrete of temperature and humidity between 7 day and 28 day are taken into account.
- 2) Average compressive strength of 4 test cylinders tested at 28 days: Equal to or greater than required average compressive strength  $(f_{cr})$  on which concrete mix design is based.
- g. Modulus of elasticity: Tests: Test 2 cylinders at 28 days for static modulus of elasticity in compression in accordance with ASTM C469.
  - Required results: Modulus of elasticity shall not be less than 54,000 times square root of the 28-day strength of the cylinders. If trial batch tests do not meet specified requirements for slump, strength, workability, consistency, modulus of elasticity, drying shrinkage, and finishing, change concrete mix design proportions and, if necessary, source of aggregate.
  - 2) Perform additional trial batches and tests until an acceptable trial batch is produced that meets requirements of this Section.
- h. Perform test batches and tests required to establish trial batches and acceptability of materials without change in Contract Price.
- i. Do not place concrete until the concrete mix design and trial batch have been accepted by Engineer.
- 2. Required average compressive strength:
  - **a**. Determine required average compressive strength  $(\mathbf{f}_{cr})$  for selection of concrete proportions for mix design, for each class of concrete, using calculated standard deviation for its corresponding specified compressive strength  $(\mathbf{f}_{c})$  in accordance with ACI 318 and ACI 350.
  - b. When test records of at least 30 consecutive tests that span period of not less than 45 calendar days are available, establish standard deviation as in accordance with ACI 318 and ACI 350 and as modified in this Section.
  - c. Provide test records from which to calculate standard deviation that represent materials, quality control procedures, and conditions similar to materials, quality control procedures, and conditions expected to apply in preparation of concrete for the Work.
  - d. Provide test records with materials and proportions that are more restricted than those for the Work.
  - e. Specified compressive strength ( $f_c$ ) of concrete used in test records: Within 1,000 pounds per square inch of that specified for the Work.
  - f. When lacking adequate test records for calculation of standard deviation meeting requirements, determine required average compressive strength  $f_{cr}$  from following Table B.

TABLE B REQUIRED AVERAGE COMPRESSION STRENGTH			
Specified Compressive Strength f <sup>c</sup> (pounds per square inch)	Required Average Compressive Strength f <sub>cr</sub> (pounds per square inch)		
Less than 3,000	$f_{c} + 1,000$		
3,000 to 5,000	$f_{c} + 1,200$		
Over 5,000	$1.10 f_{c} + 700$		

3. Aggregate:

a. Testing of concrete aggregate is at Contractor's expense.

- b. Provide test reports representing samples of materials taken and tested at the following times:
  - 1) Not more than 60 days prior to the date on the proposed materials for concrete mixes.
  - 2) Not more than 60 days prior to any change in the source of aggregates, including suppliers and/or quarries.
  - 3) Whenever there is a significant change in aggregate quality or gradation from a previously submitted and accepted source.
- c. Sample aggregate in accordance with ASTM D75.
- d. Fine and coarse aggregates:
  - 1) Gradation: Test in accordance with ASTM C136. Use sieves with square openings for testing grading of aggregates.
  - 2) Alkali-silica reactivity:
    - a) Provide fine and coarse aggregate with expansion not greater than 0.10 percent at 14 days when tested in accordance with ASTM C1260, unless the aggregate has been determined to be not deleteriously reactive based on testing in accordance with one of the following:
      - (1) ASTM C227: Expansion not greater than 0.05 percent and 3 months, and not greater than 0.10 percent at 6 months.
      - months, and not greater than 0.10 percent at 6 months. (2) ASTM C1202, Expansion not greater than 0.04 percent at
      - (2) ASTM C1293: Expansion not greater than 0.04 percent at 1 year.
- e. Fine aggregate:
  - 1) Provide fine aggregate that does not contain strong alkali nor organic matter which gives color darker than standard color when tested in accordance with ASTM C40.
  - 2) Provide aggregate having soundness in accordance with ASTM C33 when tested in accordance with ASTM C88.
- f. Coarse aggregate:
  - 1) Soundness when tested in accordance with ASTM C88: Have loss not greater than 10 percent when tested with sodium sulfate.
  - 2) Abrasion Loss: Not exceed 45 percent after 500 revolutions when tested in accordance with ASTM C131.
- g. Portland cement:
  - 1) Determination of alkali content: In accordance with ASTM C114.

# PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Liquid evaporation retardant:
  - 1. Under conditions that result in rapid evaporation of moisture from the surface of the concrete, immediately after the concrete has been screeded, coat the surface of the concrete with a liquid evaporation retardant.
  - 2. Apply the evaporation retardant again after each work operation as necessary to prevent drying shrinkage cracks.
  - 3. Conditions which result in rapid evaporation of moisture may include one or more of the following:
    - **a**. Low humidity.
    - b. Windy conditions.
    - c. High temperature.

- B. Surface sealant system:
  - 1. Apply as recommended by manufacturer published instructions.
  - 2. Where concrete continues to sweat or leak, apply additional coats of surface sealant until the sweating or leaks stop.
  - 3. Apply surface sealant system to the following surfaces:
    - a. All exposed Slab on grade on interior that will receive finishes.
- C. Joints and bonding:
  - 1. As far as practicable construct concrete work as monolith.
  - 2. Locations of construction, expansion, and other joints are indicated on the Drawings or as specified in this Section.
  - 3. Time between placement of adjacent concrete separated by joints:
    - a. Provide not less than 3 days (72 hours) between placement of adjacent sections for the following:
      - 1) Slabs.
      - 2) Walls.
    - b. Provide not less than 7 days (168 hours) between placement of upper and lower pours for the following:
      - 1) Walls over slabs.
      - 2) Slabs over walls.
      - 3) Slabs keyed into the sides of walls.
  - 4. Construction joints:
    - a. Where construction joints are not indicated on the Drawings, provide construction joints in slabs and walls at intervals not greater than 35 feet.
    - b. In order to preserve strength and watertightness of structures, make no other joints, except as authorized the Engineer.
    - **c.** At construction joints, thoroughly clean concrete of laitance, grease, oil, mud, dirt, curing compounds, mortar droppings, or other objectionable matter by means of heavy sandblasting.
    - d. Cleaning of construction joints:
      - 1) Wash construction joints free of sawdust, chips, and other debris after forms are built and immediately before concrete or grout placement.
      - 2) Should formwork confine sawdust, chips, or other loose matter in such manner that it is impossible to remove them by flushing with water, use vacuum cleaner for their removal, after which flush cleaned surfaces with water.
      - 3) Provide cleanout hole at base of each wall and column for inspection and cleaning.
    - e. At horizontal joints: As initial placement over cold joints, thoroughly spread bed of cement grout as specified in Section 03600 Grouting with a thickness of not less than 1/2 inch nor more than 1 inch.
  - 5. Keyways in joints:
    - a. Provide keyways in joints unless specifically noted otherwise on the Drawings.
    - b. Treat lumber keyway material with form release coating, applied in accordance with manufacturer's instructions.
  - 6. Take special care to ensure that concrete is well consolidated around and against waterstops and waterstops are secured in proper position.
  - 7. Contraction, construction, and expansion Joints:
    - a. Constructed where and as indicated on the Drawings.
    - b. Waterstops, expansion joint material, synthetic rubber sealing compound, and other similar materials: Concrete Accessories and Joint Sealants as specified.

- 8. Repair of concrete: Where it is necessary to repair concrete by bonding mortar or new concrete to concrete which has reached its initial set, first coat surface of set concrete with epoxy bonding agent as specified in Section 03610 Epoxies.
- D. Conveying and placing concrete:
  - 1. Convey concrete from mixer to place of final deposit by methods that prevent separation or loss of materials.
  - 2. Use equipment for chuting, pumping, and conveying concrete of such size and design as to ensure practically continuous flow of concrete at delivery end without segregation of materials.
  - 3. Design and use chutes and devices for conveying and depositing concrete that direct concrete vertically downward when discharged from chute or conveying device.
  - 4. Keep equipment for conveying concrete thoroughly clean by washing and scraping upon completion of day's placement.
- E. Placing concrete:
  - 1. Place no concrete without prior authorization of the Engineer.
  - 2. Do not place concrete until:
    - a. Reinforcement is secure and properly fastened in its correct position and loose form ties at construction joints have been retightened.
    - b. Dowels, bucks, sleeves, hangers, pipes, conduits, anchor bolts, and any other fixtures required to be embedded in concrete have been placed and adequately anchored.
    - c. Forms have been cleaned and oiled as specified.
  - 3. Do not place concrete in which initial set has occurred, or that has been retempered.
  - 4. Do not place concrete during rainstorms or high velocity winds.
  - 5. Protect concrete placed immediately before rain to prevent water from coming in contact with such concrete or winds causing excessive drying.
  - 6. Keep sufficient protective covering on hand at all times for protection of concrete.
  - 7. After acceptance, adhere to proposed sequence of placing concrete, except when specific changes are requested and accepted by the Engineer.
  - 8. Notify the Engineer in writing of readiness, not just intention, to place concrete in any portion of the work:
    - **a**. Provide this notification in such time in advance of operations, as the Engineer deems necessary to make final inspection of preparations at location of proposed concrete placing.
    - b. Place forms, reinforcement, screeds, anchors, ties, and inserts in place before notification of readiness is given to the Engineer.
    - c. Depositing concrete:
      - 1) Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing.
      - 2) Do not deposit concrete in large quantities in one place and work along forms with vibrator or by other methods.
      - 3) Do not drop concrete freely into place from height greater than 5 feet.
      - 4) Use tremies for placing concrete where drop is over 5 feet.
      - 5) Commence placement of concrete on slopes, starting at bottom of slope.
  - 9. Place concrete in approximately horizontal layers not to exceed 24 inches in depth and bring up evenly in all parts of forms.
  - 10. Continue concrete placement without avoidable interruption, in continuous operation, until end of placement is reached.

- 11. After concrete placement begins, continue concrete placement without significant interruption. Plan and implement precautions to prevent any delay, between layers being placed, from exceeding 20 minutes.
- 12. If concrete is to be placed over previously placed concrete and more than 20 minutes has elapsed, spread layer of cement grout not less than 1/2 inch in thickness nor more than 1 inch in thickness over surface before placing additional concrete.
- 13. Placement of concrete for slabs, beams, or walkways:
  - a. If cast monolithically with walls or columns, do not commence until concrete in walls or columns has been allowed to set and shrink.
  - b. Allow set time of not less than 1 hour for shrinkage.
- F. Consolidating concrete:
  - 1. Place concrete with aid of acceptable mechanical vibrators.
  - 2. Thoroughly consolidate concrete around reinforcement, pipes, or other shapes built into the work.
  - 3. Provide sufficiently intense vibration to cause concrete to flow and settle readily into place and to visibly affect concrete over radius of at least 18 inches.
  - 4. Vibrators:
    - a. Keep sufficient vibrators on hand at all times to vibrate concrete as placed.
    - b. In addition to vibrators in actual use while concrete is being placed, have on hand minimum 1 spare vibrator in serviceable condition.
    - c. Do not place concrete until it has been ascertained that all vibrating equipment, including spares, are in serviceable condition.
  - 5. Take special care to place concrete solidly against forms to leave no voids.
  - 6. Take every precaution to make concrete solid, compact, and smooth. If for any reason surfaces or interiors have voids or are in any way defective, repair such concrete in manner acceptable to the Engineer.
- G. Footings and slabs on grade:
  - 1. Do not place concrete on ground or compacted fill until subgrade is in moist condition acceptable to the Engineer.
  - 2. If necessary, sprinkle subgrade with water not less than 6 or more than 20 hours in advance of placing concrete.
  - 3. If subgrade becomes dry prior to concrete placement, sprinkle again, without forming pools of water.
  - 4. Do not place concrete if subgrade is muddy or soft. Maximum deformation of the subgrade under a fully loaded ready mix truck shall not exceed 1/2 inch.
- H. Loading concrete:
  - 1. Green concrete:
    - a. No heavy loading of green concrete will be permitted.
  - 2. No backfill shall be placed against concrete walls, connecting slabs, or beams until the concrete has reached the specified strength.
  - 3. Use construction methods, sequencing, and allow time for concrete to reach adequate strength to prevent overstress of the concrete structure during construction.
- I. Curing concrete:
  - 1. General:
    - a. Cure concrete by methods specified in this Section.
    - b. Keep concrete continuously moist and at a temperature of at least 50 degrees Fahrenheit for minimum of 7 days after placement.
    - c. Cure concrete to be painted with water or sheet membrane.

- d. Do not use sprayed membrane curing or sealing compounds on concrete surfaces that are to receive paint or upon which any material is to be bonded.
- e. Water cure or sheet membrane cure concrete slabs that are specified to be sealed by concrete sealer.
- f. Cure other concrete by water curing or sprayed membrane curing compound at the Contractor's option.
- g. Floor slabs may be cured using sheet membrane curing.
- 2. Water curing:
  - a. Keep surfaces of concrete being water cured constantly and visibly moist day and night for period of not less than 7 days.
  - b. Each day forms remain in place count as 1 day of water curing.
  - c. No further curing credit will be allowed for forms in place after contact has once been broken between concrete surface and forms.
  - d. Do not loosen form ties during period when concrete is being cured by leaving forms in place.
  - e. Flood top of walls with water at least 3 times per day, and keep concrete surfaces moist at all times during 7 day curing period.
- 3. Sprayed membrane curing compound:
  - a. Apply curing compound to concrete surface after repairing and patching, and within 1 hour after forms are removed.
  - b. If more than 1 hour elapses after removal of forms, do not use curing compound, but use water curing for full curing period.
  - c. If surface requires repairing or painting, water cure such concrete surfaces.
  - d. Do not remove curing compound from concrete in less than 7 days.
  - e. Curing compound may be removed only upon written request by Contractor and acceptance by Engineer, stating what measures are to be performed to adequately cure concrete.
  - f. Take care to apply curing compound to construction joints. Apply to all surfaces along full profile of joints.
  - g. After curing period is complete, remove curing compound placed within construction joint profile by heavy sandblasting prior to placing any new concrete.
  - h. Contractor's Option: Instead of using curing compound for curing of construction joints, such joints may be water cured.
  - i. Apply curing compound by mechanical, power operated sprayer and mechanical agitator that will uniformly mix all pigment and compound.
  - j. Apply curing compound in at least 2 coats.
  - k. Apply each coat in direction 90 degrees to preceding coat.
  - I. Apply curing compound in sufficient quantity so that concrete has uniform appearance and that natural color is effectively and completely concealed at time of spraying.
  - m. Continue to coat and recoat surfaces until specified coverage is achieved and until coating film remains on concrete surfaces.
  - n. Thickness and coverage of curing compound: Provide curing compound having film thickness that can be scraped from surfaces at any and all points after drying for at least 24 hours.
  - o. The Contractor is cautioned that method of applying curing compound specified in this Section may require more curing compound than normally suggested by manufacturer of curing compound and also more than is customary in the trade.
  - p. Apply amounts specified in this Section, regardless of manufacturer's recommendations or customary practice.

- **q.** If the Contractor desires to use curing compound other than specified curing compound, coat sample areas of concrete wall with proposed curing compound and also similar adjacent area with specified compound in specified manner for comparison:
  - 1) If proposed sample is not equal or better, in opinion of the Engineer, in all features, proposed substitution will not be allowed.
- r. Prior to final acceptance of the work, remove, by sandblasting or other acceptable method, any curing compound on surfaces exposed to view, so that only natural color of finished concrete is visible uniformly over entire surface.
- 4. Sheet membrane curing:
  - a. Install sheet membrane as soon as concrete is finished and can be walked on without damage.
  - b. Seal joints and edges with small sand berm.
  - c. Keep concrete moist under sheet membrane.
- 5. Curing of concrete:
  - a. Prevent concrete from drying during the required curing period. If water curing is used, terminate use at least 24 hours before any anticipated exposure of the concrete to freezing temperatures.
- 6. Protection of concrete:
  - a. Combustion heaters: Vent flue gases from combustion heating units to the outside of the enclosures.
  - b. Overheating and drying: Place and direct heaters and ducts to avoid areas of overheating or drying of the concrete surface.
  - c. Maximum air temperature: During the protection period, do not expose the concrete surface to air having a temperature more than 20 degrees Fahrenheit above the values shown in Table C unless higher values are required by an accepted curing method.
  - d. Protection against freezing:
    - 1) Cure and protect concrete against damage from freezing for a minimum of 3 days, unless otherwise specified.
      - a) Maintain the surface temperature of the concrete as specified in Table C.
    - 2) During periods not defined as cold weather, but when freezing temperatures may occur, protect concrete surfaces against freezing for the first 24 hours after placing.

#### 3.02 CONCRETE FINISHING

- A. Provide concrete finishes based on approved Tooled Concrete Finishing procedure and quality.
- B. Edges of joints:
  - 1. Provide joints having edges as indicated on the Drawings.
  - 2. Protect wall and slab surfaces at edges against concrete spatter and thoroughly clean upon completion of each placement.
- C. Concrete sealer:
  - 1. Floors and slabs to receive concrete sealer: As specified in the Contract Documents on finish schedule.
  - 2. Apply concrete sealer:
    - a. Apply concrete sealer at coverage rate not to exceed 300 square feet per gallon.
    - b. Apply as soon as slab or floor will bear weight.

- c. Sealer:
  - 1) Before applying concrete sealer, sweep entire surface clean with very soft bristled brush that will not mark concrete finish and remove any standing water.
  - 2) Apply concrete sealer with sprayer.
  - 3) Use of paint rollers or mop is not acceptable.
  - 4) Workmen shall wear flat soled shoes which will not mark or scar concrete surface.
  - 5) Do not allow traffic on floors and slabs until concrete sealer has dried and hardened.

#### 3.03 FIELD QUALITY CONTROL

- A. Testing of concrete:
  - 1. During progress of construction, the Owner will have tests made to determine whether the concrete, as being produced, complies with requirements specified.
  - 2. Tests will be performed in accordance with ASTM C31, ASTM C39, and ASTM C172.
  - 3. The Engineer will make and deliver test cylinders to the laboratory and testing expense will be borne by the Owner.
  - 4. Furnish test equipment.
  - 5. Make provisions for and furnish concrete for test specimens, and provide manual assistance to the Engineer in preparing said specimens.
  - 6. Assume responsibility for care of and providing of curing conditions for test specimens in accordance with ASTM C31.
  - 7. Sampling frequency:
    - **a**. 1 set of test cylinders for each 50 cubic yards of each class of concrete.
    - b. Minimum of 1 set of test cylinders for each class of concrete placed.
    - c. Not less than 1 set of test cylinders for each half-day's placement.
    - d. At least 2 sets of test cylinders for each structure.
- B. Compressive strength tests:
  - 1. Set of 5 cylinder specimens, 6-inch diameter by 12 inch long.
  - 2. Information: Test 2 cylinders at 7 days.
  - 3. Acceptance: Test 2 cylinders at 28 days.
  - 4. One Hold
- C. Slump tests:
  - 1. Test slump of concrete using slump cone in accordance with ASTM C143.
  - 2. Do not use concrete that does not meet specification requirements in regard to slump:
    - a. Remove such concrete from project site.
    - b. Test slump at the beginning of each placement, as often as necessary to keep slump within the specified range, and when requested to do so by the Engineer.
- D. Air entrainment tests:
  - 1. Test percent of entrained air in concrete at beginning of each placement, as often as necessary to keep entrained air within specified range, and when requested to do so by the Engineer.
  - Do not use concrete that does not meet Specification requirements for air entrainment:
     a. Remove such concrete from project site.
  - 3. Test air entrainment in concrete in accordance with ASTM C173.

- 4. The Engineer may at any time test percent of entrained air in concrete received on project site.
- E. Enforcement of strength requirement:
  - 1. Concrete is expected to reach a compressive strength (f'<sub>c</sub>) equal to or greater than that the minimum specified in Table A.
  - 2. Strength level of concrete will be considered acceptable if following conditions are satisfied:
    - a. Averages of all sets of 3 consecutive strength test results is greater or equal to specified compressive strength( $f_c$ ).
    - b. No individual strength test (average of 2 cylinders) falls below specified compressive strength (f<sub>c</sub>) by more than 500 pounds per square inch.
  - 3. Non-compliant strength tests:
    - a. Mark non-compliant strength test reports to highlight that they contain noncomplying results and immediately forward copies of test reports to all parties on the test report distribution list.
    - b. Provide treatment of non-compliant concrete at no additional cost to Owner and with no additional time added to project schedule:
    - c. Initial treatment may consist of additional curing and testing of the affected concrete.
      - 1) Provide additional curing of concrete using means and duration acceptable to the Engineer.
      - 2) Upon completion of the additional curing, provide additional testing designated by the Engineer.
        - a) Obtain and test core samples for compression strength in accordance with ASTM C42, ACI 318, and ACI 350.
        - b) Provide not less than 3 cores for each affected area. Obtain Engineer's acceptance of proposed coring locations before proceeding with that work.
        - c) Submit report of compression strength testing for Engineer's review.
        - d) If required by the Engineer, provide additional cores and obtain petrographic examination in accordance with ASTM C856. Submit report of petrographic analysis for Engineer's review.
      - 3) If additional curing does not bring average of 3 cores taken in affected area to at least the minimum specified compressive strength (f<sub>c</sub>), designate such concrete in affected area as defective.

# 3.04 ADJUSTING

- A. Provide repair of defective concrete at no additional cost to Owner and with no additional time added to the project schedule:
- B. Make repairs using approach and means acceptable to the Engineer:
  - 1. Provide repairs having strength equal to or greater than specified concrete for areas involved.
  - 2. Do not patch, repair, or cover defective work without inspection by the Engineer.
  - 3. Acceptable means may include, but are not limited to strengthening, repair, or removal and replacement.
- C. Strengthening of defective concrete:
  - 1. By addition of concrete.
  - 2. By addition of reinforcing.

- 3. By addition of both concrete and reinforcing.
- D. Repairs:
  - 1. Methods of repair:
    - a. Dry pack method:
      - 1) Use for holes having depth nearly equal to or greater than least surface dimension of hole, for cone-bolt holes, and for narrow slots cut for repair.
      - 2) Smooth holes: Clean and roughen by heavy sandblasting before repair.
    - b. Mortar replacement method:
      - 1) Use for holes too wide to dry pack and too shallow for concrete replacement.
      - 2) Comparatively shallow depressions, large or small, which extend no deeper than nearest surface reinforcement.
    - c. Concrete replacement method:
      - Use when holes extend entirely through concrete section or when holes are more than 1 square foot in area and extend halfway or more through the section.
  - 2. Preparation of concrete for repair:
    - a. Chip out and key imperfections in the work and make them ready for repair.
    - b. Obtain Engineer's acceptance of surface preparation methods and of prepared surfaces prior to repair.
    - c. Surfaces of set concrete to be repaired: First coat with epoxy bonding agent as specified in Section 03610 Epoxies.
- E. Remove and replace defective concrete.

# END OF SECTION

### SECTION 03320 ASPHALT PAVING

## PART 1 - GENERAL

### 1.01 APPLICABLE STANDARDS:

- A. The work included in this section consists of construction of asphaltic concrete pavements.
- B. Asphaltic concrete surface, base and wedge course materials and construction shall be in accordance with APWA Standard Specification and Design Criteria Section 2205.
- C. Recycled asphaltic concrete shall be in conformance with APWA Standard Specification and Design Criteria Section 2205.9.

#### PART 2 - PRODUCTS

### 2.01 MATERIALS:

- A. Base course shall be Type 1-01 mixture. Recycled asphaltic concrete materials may be used in the base course.
- B. Surface and wedge courses shall be Type 3-01 mixture. Surface courses three (3) inches or greater in thickness shall be placed in two lifts.

### PART 3 - EXECUTION

### 3.01 TOLERANCES:

- A. Surface smoothness, measured with a 10-foot straightedge applied both parallel and perpendicular to the centerline of the roadway, shall not exceed the following:
  - 1. Final layer of base course 3/8 inch.
  - 2. Final surface course 1/4 inch.
- B. Should these limits be exceeded, the Contractor shall correct deviation by cold planing or cold milling. Spot wedging will not be permitted to correct surface smoothness irregularities.

#### 3.02 HAULING AND PLACING:

A. The Contractor shall limit loads of hauling, spreading and placing equipment on earth subgrade and previously constructed pavement courses as necessary to avoid excessive deflection or damage to the underlying pavement or subgrade.

# END OF SECTION

# SECTION 03600 GROUTING

#### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Cement grout.
  - 2. Cement mortar.
  - 3. Dry-pack mortar.
  - 4. Epoxy grout.
  - 5. Grout.
  - 6. Non-shrink epoxy grout.
  - 7. Non-shrink grout.

#### 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars using 2-inch cube specimens.
  - 2. C230 Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.
  - 3. C531 Standard Test Method for Liner Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
  - 4. C579 Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings and Polymer Concretes.
  - 5. C939 Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
  - 6. C942 Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory.
  - 7. C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
  - 8. C1181 Standard Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
- B. International Concrete Repair Institute (ICRI):
  - 1. 310.2R Selecting and specifying Concrete Surface Preparations for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

#### 1.03 SUBMITTALS

- A. Cement grout:
  - 1. Mix design.
  - 2. Material submittals.
- B. Cement mortar:
  - 1. Mix design.
  - 2. Material submittals.
- C. Non-shrink epoxy grout:
  - 1. Manufacturer's literature.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- D. Non-shrink grout:
  - 1. Manufacturer's literature.

# 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to jobsite in their original, unopened packages or containers, clearly labeled with manufacturer's product identification and printed instructions.
- B. Store materials in cool dry place and in accordance with manufacturer's recommendations.
- C. Handle materials in accordance with the manufacturer's instructions.

# PART 2 PRODUCTS

# 2.01 MANUFACTURED UNITS

- A. Non-shrink epoxy grout:
  - 1. Manufacturers: One of the following or equal:
    - a. Five Star Products, Inc., Five Star Epoxy Grout.
    - b. BASF Construction Chemicals, Masterflow 648 CP Plus.
    - c. L&M Construction Chemicals, Inc., EPOGROUT.
  - 2. Non-shrink epoxy grout shall be 100 percent solid, premeasured, prepackaged system containing 2-component thermosetting epoxy resin and inert aggregate.
  - 3. Maintain flowable consistency for at least 45 minutes at 70 degrees Fahrenheit.
  - 4. Shrinkage or expansion: Less than 0.0006 inches per inch when tested in accordance with ASTM C531.
  - 5. Minimum compressive strength: 10,000 pounds per square inch at 24 hours and 14,000 pounds per square inch at 7 days when tested in accordance with ASTM C579, Method B.
  - 6. Compressive creep: Not exceed 0.0027 inches/per inch when tested under 400 pounds per square inch constant load at 140 degrees Fahrenheit in accordance with ASTM C1181.
  - 7. Coefficient of thermal expansion: Not exceed 0.000018 inches per inch per degree Fahrenheit when tested in accordance with ASTM C531, Method B.
- B. Non-shrink grout:
  - 1. Manufacturers: One of the following or equal:
    - a. Five Star Products, Inc., Five Star Grout.
    - b. BASF Construction Chemicals, Masterflow 928.
    - c. L&M Construction Chemicals, Inc., CRYSTEX.
  - 2. In accordance with ASTM C1107.
  - 3. Preportioned and prepackaged cement-based mixture.
  - 4. Contain no metallic particles such as aluminum powder and no metallic aggregate such as iron filings.
  - 5. Require only addition of potable water.
  - 6. Water for pre-soaking, mixing, and curing: Potable water.
  - 7. Free from emergence of mixing water from within or presence of water on its surface.
  - 8. Remain at minimum flowable consistency for at least 45 minutes after mixing at 45 degrees Fahrenheit to 90 degrees Fahrenheit when tested in accordance with ASTM C230.
    - a. If at fluid consistency, verify consistency in accordance with ASTM C939.
  - 9. Dimensional stability (height change):

- a. In accordance with ASTM C1107, volume-adjusting Grade B or C at 45 degrees Fahrenheit to 90 degrees Fahrenheit.
- b. Have 90 percent or greater bearing area under bases.
- 10. Have minimum compressive strengths at 45 degrees Fahrenheit to 90 degrees Fahrenheit in accordance with ASTM C1107 for various periods from time of placement, including 5,000 pounds per square inch at 28 days when tested in accordance with ASTM C109 as modified by ASTM C1107.

## 2.02 MIXES

- A. Cement grout:
  - 1. Use same sand-to-cementitious materials ratio for cement grout mix that is used for concrete mix.
  - 2. Use same materials for cement grout that are used for concrete.
  - 3. Use water-to-cementitious materials ratio that is no more than that specified for concrete.
  - 4. For spreading over surfaces of construction or cold joints.
- B. Cement mortar:
  - 1. Use same sand-to-cementitious materials ratio for cement mortar mix that is used for concrete mix.
  - 2. Use same materials for cement mortar that are used for concrete.
  - 3. Use water-to-cementitious materials ratio that is no more than that specified for concrete being repaired.
  - 4. At exposed concrete surfaces not to be painted or submerged in water: Use sufficient white cement to make color of finished patch match that of surrounding concrete.
- C. Dry-pack mortar:
  - 1. Proportions by weight: 1 part Portland cement to 2 parts concrete sand.
    - a. Portland cement: As specified in Section 03300 Cast-in-Place Concrete.
    - b. Concrete sand: As specified in Section 03300 Cast-in-Place Concrete.
- D. Epoxy grout:
  - 1. Consist of mixture of epoxy or epoxy gel and sand.
    - a. Epoxy: As specified in Section 03610 Epoxies.
    - b. Epoxy gel: As specified in Section 03610 Epoxies.
    - c. Sand: Clean, bagged, graded, and kiln-dried silica sand.
  - 2. Proportioning:
    - a. For horizontal work: Consist of mixture of 1-part epoxy with not more than 2 parts sand.
    - b. For vertical or overhead work: Consist of 1-part epoxy gel with not more than 2 parts sand.
- E. Grout:
  - 1. Mix in proportions by weight: 1 part portland cement to 4 parts concrete sand.
    - a. Portland cement: As specified in Section 03300 Cast-in-Place Concrete.
    - b. Concrete sand: As specified in Section 03300 Cast-in-Place Concrete.
- F. Non-shrink epoxy grout:
  - 1. Mix in accordance with manufacturer's installation instructions.

- G. Non-shrink grout:
  - 1. Mix in accordance with manufacturer's installation instructions such that resulting mix has flowable consistency and is suitable for placing by pouring.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Inspect concrete surfaces to receive grout or mortar and verify that they are free of ice, frost, dirt, grease, oil, curing compounds, paints, impregnations, and loose material or foreign matter likely to reduce bond or performance of grout or mortar.

### 3.02 PREPARATION

- A. Surface preparation for grouting other baseplates:
  - 1. Remove grease, oil, dirt, dust, curing compounds, laitance, and other deleterious materials that may affect bond to concrete and bottoms of baseplates.
  - 2. Roughen concrete surfaces in contact with grout to ICRI CSP-6 surface profile or rougher.
    - a. Remove loose or broken concrete.
  - 3. Metal surfaces in contact with grout: Grit blast to white metal surface.

# 3.03 INSTALLATION

- A. Mixing:
  - 1. Cement grout:
    - a. Use mortar mixer with moving paddles.
    - b. Pre-wet mixer and empty out excess water before beginning mixing.
  - 2. Cement mortar:
    - a. Use mortar mixer with moving paddles.
    - b. Pre-wet mixer and empty out excess water before beginning mixing.
  - 3. Dry-patch mortar:
    - a. Use only enough water so that resulting mortar will crumble to touch after being formed into ball by hand.
  - 4. Non-shrink epoxy grout:
    - a. Keep temperature of non-shrink epoxy grout from exceeding manufacturer's recommendations.
  - 5. Non-shrink grout:
    - a. May be drypacked, flowed, or pumped into place. Do not overwork grout.
    - b. Do not retemper by adding more water after grout stiffens.

#### B. Placement:

- 1. Cement grout:
  - a. Exercise care in placing cement grout because it is required to furnish structural strength, impermeable water seal, or both.
  - b. Do not use cement grout that has not been placed within 30 minutes after mixing.
- 2. Cement mortar:
  - a. Use mortar mixer with moving paddles.
  - b. Pre-wet mixer and empty out excess water before beginning mixing.
- 3. Epoxy grouts:
  - a. Wet surfaces with epoxy for horizontal work or epoxy gel for vertical or overhead work prior to placing epoxy grout.

- 4. Non-shrink epoxy grout:
  - a. Mix in complete units. Do not vary ratio of components or add solvent to change consistency of mix.
  - b. Pour hardener into resin and mix for at least 1 minute and until mixture is uniform in color. Pour epoxy into mortar mixer wheelbarrow and add aggregate. Mix until aggregate is uniformly wetted. Over mixing will cause air entrapment in mix.
- 5. Non-shrink grout:
  - a. Add non-shrink cement grout to premeasured amount of water that does not exceed the manufacturer's maximum recommended water content.
  - b. Mix in accordance with manufacturer's instructions to uniform consistency.
- C. Curing:
  - 1. Cement based grouts and mortars:
    - **a**. Keep continuously wet for minimum of 7 days. Use wet burlap, soaker hose, sun shading, ponding, and in extreme conditions, combination of methods.
    - b. Maintain above 40 degrees Fahrenheit until it has attained compressive strength of 3,000 pounds per square inch, or above 70 degrees Fahrenheit for minimum of 24 hours to avoid damage from subsequent freezing.
  - 2. Epoxy based grouts:
    - a. Cure grouts in accordance with manufacturers' recommendations.
      - 1) Do not water cure epoxy grouts.
    - b. Do not allow any surface in contact with epoxy grout to fall below 50 degrees Fahrenheit for minimum of 48 hours after placement.
- D. Grouting equipment bases, baseplates, soleplates, and skids: As specified.
- E. Grouting other baseplates:
  - 1. General:
    - a. Use non-shrink grout as specified in this Section.
    - b. Baseplate grouting shall take place from one side of baseplate to other in continuous flow of grout to avoid trapping air in grout.
    - c. Maintain hydrostatic head pressure by keeping level of grout in headbox above bottom of baseplate. Fill headbox to maximum level and work grout down.
    - d. Vibrate, rod, or chain non-shrink grout to facilitate grout flow, consolidate grout, and remove trapped air.
  - 2. Forms and headboxes:
    - a. Build forms using material with adequate strength to withstand placement of grouts.
    - b. Use forms that are rigid and liquid tight. Caulk cracks and joints with elastomeric sealant.
    - c. Line forms with polyethylene for easy grout release. Coating forms with 2 coats of heavy-duty paste wax is also acceptable.
    - d. Headbox shall be 4 to 6 inches higher than baseplate and shall be located on one side of baseplate.
    - e. After grout sets, remove forms and trim back grout at 45-degree angle from bottom edges of baseplate.

# 3.04 FIELD QUALITY CONTROL

# A. Non-shrink epoxy grout:

1. Test for 24-hour compressive strength in accordance with ASTM C579, Method B.

# B. Non-shrink grout:

1. Test for 24-hour compressive strength in accordance with ASTM C942.

# END OF SECTION

# SECTION 03610 EPOXIES

#### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Epoxy.
  - 2. Epoxy gel.
  - 3. Epoxy bonding agent.

#### 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. C881 Standard Specification for Epoxy-Resin-Base Systems for Concrete.
  - 2. C882 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
  - 3. D638 Standard Test Method for Tensile Properties of Plastics.
  - 4. D695 Standard Test Method for Compressive Properties of Rigid Plastics.

#### 1.03 SYSTEM DESCRIPTION

- A. Performance requirements:
  - 1. Provide epoxy materials that are new.
  - 2. Store and use products within limitations set forth by manufacturer.
  - 3. Perform and conduct work of this Section in neat orderly manner.

#### 1.04 SUBMITTALS

- A. General: Submit in accordance with Submittals Procedure.
- B. Product Data: Submit manufacturer's data completely describing epoxy materials:
  - 1. Submit evidence of conformance to ASTM C881. Include manufacturer's designations of Type Grade, Class, and Color.
  - 2. Submit documentation that materials meet or exceed the specified strength and performance characteristics. Indicate test methods and test results.
- C. Quality control submittals:
  - 1. Manufacturer's installation instructions.

#### PART 2 PRODUCTS

- 2.01 MATERIALS
  - A. General:
    - 1. Moisture tolerant, water-insensitive, two-component epoxy resin adhesive material containing 100 percent solids, and meeting or exceeding the performance properties specified when tested in accordance with the standards specified.

- B. Epoxy: Low viscosity product in accordance with ASTM C881; Types I, II and IV; Grade 1; Class C.
  - 1. Manufacturers: One of the following or equal:
    - a. BASF, MasterInject 1500.
    - b. Dayton Superior, Sure Inject J56.
    - c. Sika Corporation, Sikadur 35 Hi-Mod LV.
  - 2. Required properties:

Table 1 - Material Properties - Epoxy				
Property	Test Method Required Results ("neat")			
Tensile Strength (7-day)	ASTM D638	7,100 pounds per square inch, minimum.		
Compressive Strength (7-day)	ASTM D695	11,000 pounds per square inch, minimum.		
Bond Strength (2-day)	ASTM C882	1,500 pounds per square inch, minimum. Concrete failure before failure of epoxy.		
Viscosity (mixed)		250-550 centipoise		
Notes:	Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.			

- C. Epoxy gel: Non-sagging product in accordance with ASTM C881, Types I and IV, Grade 3 Class C.
  - 1. Manufacturers: One of the following or equal:
    - a. BASF, MasterEmaco ADH 327.
    - b. Dayton Superior, Sure Anchor J50.
    - c. Sika Corp., Sikadur 31, Hi-Mod Gel.
  - 2. Required properties:

Table 2 - Material Properties - Epoxy Gel				
Property	Test Method	Required Results ("neat")		
Tensile Strength (7-day)	ASTM D638	2,000 pounds per square inch, minimum.		
Compressive Yield Strength (7-day)	ASTM D695	8,000 pounds per square inch, minimum.		
Bond Strength (14-day)	ASTM C882	1,500 pounds per square inch, minimum.		
Notes:	Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.			

- D. Epoxy bonding agent: Non-sagging product in accordance with ASTM C881, Type II, Grade 2, Class C.
  - 1. Manufacturers: One of the following or equal:
    - a. BASF, MasterEmaco ADH 326.
    - b. Dayton Superior, Sure Bond J58.

c. Sika Chemical Corp., Sikadur 32 Hi-Mod LPL.

Table 3 - Material Properties - Epoxy Bonding Agent				
Property	Test Method	Required Results		
Tensile Strength (7-day)	ASTM D638	3,300 pounds per square inch, minimum.		
Compressive Yield Strength (7-day)	ASTM D695	8,300 pounds per square inch, minimum.		
Bond Strength (14-days)	ASTM C882	1,800 pounds per square inch, minimum. Concrete failure before failure of epoxy bonding agent.		
Pot Life	-	Minimum 60 minutes at 75 degrees Fahrenheit.		
Notes:	Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.			

2. Required properties.

3. If increased contact time is required for concrete placement, epoxy resin/portland cement bonding agent as specified in Section 03620 - Epoxy Resin/Portland Cement Bonding Agent may be used instead of epoxy bonding agent.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install and cure epoxy materials in accordance with manufacturer's installation instructions.
- B. Epoxy:
  - 1. Apply in accordance with manufacturer's installation instructions.
- C. Epoxy gel:
  - 1. Apply in accordance with manufacturer's installation instructions.
  - 2. Use for vertical or overhead work, or where high viscosity epoxy is required.
  - 3. Epoxy gel used for vertical or overhead work may be used for horizontal work.
- D. Epoxy bonding agent:
  - 1. Apply in accordance with manufacturer's installation instructions.
  - 2. Bonding agent will not be required for filling form tie holes or for normal finishing and patching of similar sized small defects.

# END OF SECTION

### SECTION 03620 EPOXY RESIN/PORTLAND CEMENT BONDING AGENT

PART 1 GENERAL

#### 1.01 SUMMARY

A. Section includes: Epoxy resin/portland cement bonding agent.

#### 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens).
  - 2. C348 Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
  - 3. C496 Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
  - 4. C882 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
- B. Federal Highway Administration (FHWA):
  - 1. FHWA-RD-86-193 Highway Concrete Pavement Technology Development and Testing Volume V: Field Evaluation of SHRP C9206 Test Sites (Bridge Deck Overlays).

# PART 2 PRODUCTS

# 2.01 MANUFACTURERS

- A. Sika Corp., Sika Armatec 110.
- B. Substitutions: The use of other than the specified product will be considered, providing the Contractor requests its use in writing to the Engineer. This request shall be accompanied by:
  - 1. A certificate of compliance from an approved independent testing laboratory that the proposed substitute product meets or exceeds specified performance criteria, tested in accordance with the specified test standards.
  - 2. Documented proof that the proposed substitute product has a 1-year proven record of performance of bonding portland cement mortar/concrete to hardened portland cement mortar/concrete, confirmed by actual field tests and 5 successful installations that the Engineer can investigate.

# 2.02 MATERIALS

- A. Epoxy resin/portland cement adhesive:
  - 1. Component "A" shall be an epoxy resin/water emulsion containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.
  - 2. Component "B" shall be primarily a water solution of a polyamine.
  - 3. Component "C" shall be a blend of selected portland cements and sands.
  - 4. The material shall not contain asbestos.

### 2.03 PERFORMANCE CRITERIA

- A. Properties of the mixed epoxy resin/portland cement adhesive:
  - 1. Pot life: 75 to 105 minutes.
  - 2. Contact time: 24 hours.
  - 3. Color: Dark gray.
- B. Properties of the cured epoxy resin/portland cement adhesive:
  - 1. Compressive strength in accordance with ASTM C109:
    - a. 3 day: 4,500 pounds per square-inch minimum.
    - b. 7 days: 6,500 pounds per square-inch minimum.
    - c. 28 days: 8,500 pounds per square-inch minimum.
  - 2. Splitting tensile strength in accordance with ASTM C496:
    - a. 28 days: 600 pounds per square-inch minimum.
  - 3. Flexural strength:
    - a. 1,100 pounds per square-inch minimum in accordance with ASTM C348.
  - 4. Bond strength in accordance with ASTM C882 modified at 14 days:
    - a. 0 hours open time: 2,800 pounds per square-inch minimum.
    - b. 24 hours open time: 2,600 pounds per square-inch minimum.
  - 5. The epoxy resin/portland cement adhesive shall not produce a vapor barrier.
  - 6. Material must be proven to prevent corrosion of reinforcing steel when tested under the procedures as set forth by the FHWA Program Report Number FHWA-RD-86-193. Proof shall be in the form of an independent testing laboratory corrosion report showing prevention of corrosion of the reinforcing steel.

# PART 3 EXECUTION

# 3.01 INSTALLATION

- A. Mixing the epoxy resin: Shake contents of Component "A" and Component "B." Empty all of both components into a clean, dry mixing pail. Mix thoroughly for 30 seconds with a jiffy paddle on a low-speed with 400 to 600 revolutions per minute drill. Slowly add the entire contents of Component "C" while continuing to mix for a minimum of 3 minutes and until uniform with no lumps. Mix only the quantity that can be applied within its pot life.
- B. Placement procedure:
  - 1. Apply to prepared surface with stiff-bristle brush, broom, or "hopper-type" spray equipment:
    - a. For hand applications: Place fresh plastic concrete/mortar while the bonding bridge adhesive is wet or dry, up to 24 hours.
    - b. For machine applications: Allow the bonding bridge adhesive to dry for 12 hours minimum.
- C. Adhere to all limitations and cautions for the epoxy resin/portland cement adhesive in the manufacturer's current printed literature.

# 3.02 CLEANING

A. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

# END OF SECTION

Birmingham Pump Station Screen Replacement Kansas City, Missouri

### SECTION 03900 STRUCTURAL CONCRETE REPAIR

### PART 1 GENERAL

#### 1.01 SUMMARY

A. Section includes: Repairing damaged structural concrete.

#### 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars Using 2-in. Cube Specimens).
  - 2. C293 Standard Test Method for Flexural Strength of Concrete Using Simple Beam with Center-Point Loading and the size of the beam shall be 6 by 6 in.
  - 3. C348 Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
  - 4. C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
  - 5. C882 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete By Slant Shear.

### 1.03 SYSTEM DESCRIPTION

- A. General: Structural repair concrete composed of cementitious material capable of being placed in formed vertical and overhead applications, and on horizontal surfaces.
- B. Design requirements:
  - 1. Provide material suitable for performing in environments subject to corrosive attack by chlorides and sulfates, freeze/thaw cycles, low permeability, and abrasion resistant.
  - 2. Provide concrete repair mortar cement that is placeable from 1 inch in depth and extendable in greater depths.
  - 3. Concrete repair mortar shall be capable of being poured in place or troweled in place to suit the conditions encountered.

#### 1.04 SUBMITTALS

- A. Product data: Submit manufacturer's data completely describing structural repair concrete materials.
- B. Certificates of Compliance.
- C. Manufacturer's Instructions.

### 1.05 QUALITY ASSURANCE

- A. Manufacturer qualifications: The manufacturer of the specified product shall have been in existence, for a minimum of 10 years.
- B. Allowable tolerances: Deviation from plumb or level shall not exceed 1/8 inch within 10 feet in any direction, as determined with a 10-foot straight edge.

# 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver the specified product in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers.
- B. Store and condition the specified product as recommended by the manufacturer.
- C. Deliver, store, and handle packaged materials in the manufacturer's original, sealed containers, each clearly identified with the manufacturer's name, and name and type of product.
- D. Store materials subject to damage by dirt and moisture in a clean, dry location, off the ground, and suitably protected.

### 1.07 PROJECT CONDITIONS

- A. Existing conditions:
  - 1. Hot weather: ACI 305.
  - 2. Cold weather: ACI 306.
  - 3. Do not place concrete repair mortar during precipitation, unless adequate protection is provided.

### PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Structural repair concrete:
  - 1. Manufacturers: One of the following or equal:
    - a. BASF, EMACO S66-CI.
    - b. Sika Corp., SikaTop 123 Plus.
  - 2. Compressive strength: As follows in accordance with ASTM C109:
    - a. 1 day: 2,500 pounds per square inch, minimum.
    - b. 7 day: 6,000 pounds per square inch, minimum.
    - c. 28 day: 7,000 pounds per square inch, minimum.
  - 3. Bond strength by slant shear: 2,200 pounds per square inch minimum at 28 days, in accordance with ASTM C882 modified.
  - 4. Flexural strength: 2,000 pounds per square inch minimum at 28 days, when tested in accordance with ASTM .C293, or 770 pounds per square inch minimum at 28 days when tested in accordance with ASTM C348.
  - Rapid freeze/thaw durability: in accordance with ASTM C666; Procedure A.
     a. Relative durability factor at 300 cycles: 95 percent minimum.
  - 6. Working time: 30 to 40 minutes.
  - 7. Color: Concrete gray.
- B. Water: Potable, clean, not detrimental to concrete.
- C. Form materials:
  - 1. Smooth finish.
  - 2. Brace as required to maintain tolerances.

## PART 3 EXECUTION

#### 3.01 EXAMINATION

A. Verify that concrete surfaces and exposed reinforcing are clean and free of contaminates.

## 3.02 PREPARATION

- A. Prepare existing concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. Thoroughly clean reinforcement and other embedded items to remove loose rust and other objectionable matter.
- C. Thoroughly wet wood forms, except coated plywood, and adjacent concrete at least 1 hour in advance of placing concrete; securely close cleanout end inspection ports; repeat wetting as necessary to keep forms damp.
- D. Damaged concrete:
  - 1. Areas to be repaired shall be clean, sound, and free of contaminants.
    - a. Remove all loose and deteriorated concrete by mechanical means acceptable to the Engineer.
    - b. Saw cut perimeter 1/2-inch maximum.
  - 2. Chip concrete substrate to obtain a surface profile of 1/16 inch to 1/8 inch in depth with a new fractured aggregate surface.
    - a. The area to be repaired shall be not less than 1 inch in depth.
  - 3. Concrete removal shall extend along the reinforcing steel to locations along the bar free of bond inhibiting corrosion, and where the bar is well bonded to surrounding concrete.
- E. Use the following procedures where reinforcing steel with active corrosion is encountered:
  - 1. Sandblast reinforcing steel to remove all contaminants and rust.
  - 2. Determine section loss, splice new reinforcing steel where there is more than 20 percent loss as directed by the Engineer.
    - a. If more than half the diameter of the reinforcing steel is exposed, chip out behind the reinforcing steel a minimum of 1/2 inch. The distance chipped behind the reinforcing steel must also equal or exceed the minimum placement depth of the accepted material.
- F. Treat cracks in the substrate at the area of patching or overlay work as directed by the Engineer.
- G. Extend existing control and expansion joints through any concrete repair.
- H. Apply an epoxy-bonding agent to area to be repaired, as specified in Section 03610 Epoxies prior to patching concrete with polymer-modified portland cement mortar.

#### 3.03 MIXING

A. Mix in accordance with manufacturer's mixing instructions.

# 3.04 INSTALLATION

- A. Formed surface finishes:
  - 1. Smooth finish:
    - a. Obtain by the use of plywood, sheet metal, or lined wood forms; no fins, pockmarks, or other irregularities shall be present in the exposed surfaces of concrete.
    - b. Place no structural repair concrete without prior authorization of Engineer.
- B. Verify that form materials are in place and ready to receive installation of concrete repair material.
- C. Install in accordance with manufacturer's installation instructions.
- D. In accordance with ACI recommendations, apply concrete repair material only when ambient conditions of moisture, temperature, and humidity, are favorable for curing.
- E. Scrub mortar into substrate, filling all cracks, voids, and pores.
- F. For new construction, finish of repaired area shall match required finish for concrete being repaired.
- G. For existing concrete, finish of repair area shall match finish of concrete being repaired.
- H. During the curing process, protect concrete repair from rain, external moisture fluctuation, or freezing as required:
  - 1. Keep sufficient covering on hand at all times for protection of repair concrete.

# 3.05 CLEANING

A. Remove debris and excess material. Leave work site in a neat, clean condition.

# END OF SECTION

### SECTION 05090 MECHANICAL ANCHORING AND FASTENING TO CONCRETE

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Cast-in anchors and fasteners:
    - a. Anchor bolts.
    - b. Anchor rods.
    - c. Welded studs.
  - 2. Post-installed steel anchors and fasteners:
    - a. Concrete anchors.

### 1.02 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. 355.2 Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary.
- B. American National Standards Institute (ANSI):
  - 1. B212.15 Cutting Tools Carbide-tipped Masonry Drills and Blanks for Carbide-tipped Masonry Drills.
- C. American Welding Society (AWS):
  - 1. D1.1 Structural Welding Code Steel.
  - 2. D1.6 Structural Welding Code Stainless Steel.
- D. ASTM International (ASTM):
  - 1. A29 Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for.
  - 2. A36 Standard Specification for Carbon Structural Steel.
  - 3. A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 4. A108 Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished.
  - 5. A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 6. A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 7. A240 Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - 8. A380 Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
  - 9. A496 Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
  - 10. A563 Standard Specification for Carbon and Alloy Steel Nuts.
  - 11. B633 Standard Specification for *Electrodeposited* Coatings of Zinc on Iron and Steel.
  - 12. B695 Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
  - 13. E488 Standard Test Methods for Strength of Anchors in Concrete Elements.
  - 14. F436 Standard Specification for Hardened Steel Washers.
  - 15. F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.

- 16. F594 Standard Specification for Stainless Steel Nuts.
- 17. F1554 Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
- F2329 Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- E. International Code Council Evaluation Service, Inc. (ICC-ES):
  - 1. AC01 Acceptance Criteria for Expansion Anchors in Masonry Elements.
  - 2. AC106 Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry.
  - 3. AC193 Acceptance Criteria for Mechanical Anchors in Concrete Elements.

# 1.03 DEFINITIONS

- A. Built-in anchor: Headed bolt or assembly installed in position before filling surrounding masonry units with grout.
- B. Cast-in anchor: Headed bolt or assembly installed in position before placing plastic concrete around.
- C. Overhead installations: Fasteners installed on overhead surfaces where the longitudinal axis of the fastener is more than 60 degrees above a horizontal line so that the fastener resists sustained tension loads.
- D. Passivation: Chemical treatment of stainless steel with a mild oxidant for the purpose of enhancing the spontaneous formation of the steel's protective passive film.
- E. Post-installed anchor: Fastener or assembly installed in hardened concrete or finished masonry construction, typically by drilling into the structure and inserting a steel anchor assembly.
- F. Terms relating to structures or building environments as used with reference to anchors and fasteners:
  - 1. Corrosive locations: Describes interior and exterior locations as follows:
    - a. Locations used for delivery, storage, transfer, or containment (including spill containment) of chemicals used for plant treatment processes.
    - b. Exterior and interior locations at the following treatment structures:
      - 1) Wastewater treatment facilities: Liquids stream:
        - a) Raw wastewater delivery and holding structures.
        - b) Headworks and grit facilities.
        - c) Primary clarifiers and primary clarifier flow splitting boxes.
        - d) Chlorine contact structures.
  - 2. Wet and moist locations: Describes locations, other than "corrosive locations," that are submerged, are immediately above liquid containment structures, or are subject to frequent wetting, splashing, or wash down. Includes:
    - a. Exterior portions of buildings and structures.
    - b. Liquid-containing structures:
      - 1) Locations at and below the maximum operating liquid surface elevation.
      - 2) Locations above the maximum operating liquid surface elevation and:
        - a) Below the top of the walls containing the liquid.

- b) At the inside faces and underside surfaces of a structure enclosing or spanning over the liquid (including walls, roofs, slabs, beams, or walkways enclosing the open top of the structure).
- c. Liquid handling equipment:
  - 1) Bases of pumps and other equipment that handles liquids.
- d. Indoor locations exposed to moisture, splashing, or routine wash down during normal operations, including floors with slopes toward drains or gutters.
- e. Other locations indicated on the Drawings.
- 3. Other locations:
  - a. Interior dry areas where the surfaces are not exposed to moisture or humidity in excess of typical local environmental conditions.

### 1.04 SUBMITTALS

- A. General:
  - 1. Submit as specified in Division 1 Submittal Procedures.
  - 2. Submit information listed for each type of anchor or fastener to be used.
- B. Action submittals:
  - 1. Product data:
    - a. Cast-in anchors:
      - 1) Manufacturer's data including catalog cuts showing anchor sizes and configuration, materials, and finishes.
    - b. Post-installed anchors:
      - 1) For each anchor type, manufacturer's data including catalog cuts showing anchor sizes and construction, materials and finishes, and load ratings.
  - 2. Samples:
    - a. Samples of each type of anchor, including representative diameters and lengths, if requested by the Engineer.
  - 3. Certificates:
    - a. Cast-in anchors:
      - 1) Mill certificates for steel anchors that will be supplied to the site.
    - b. Post-installed anchors:
      - 1) Manufacturer's statement or certified test reports demonstrating that anchors that will be supplied to the site comply with the materials properties specified.
  - 4. Test reports:
    - a. Post-installed anchors: For each anchor type used for the Work:
      - 1) Current ICC-ES Report (ESR) or equivalent acceptable to the Engineer and the authority having jurisdiction, demonstrating:
        - a) Acceptance of that anchor for use under the building code specified in Division 1 Regulatory Requirements.
  - 5. Manufacturer's instructions:
    - a. Requirements for storage and handling.
    - b. Recommended installation procedures including details on drilling, hole size (diameter and depth), hole cleaning and preparation procedures, anchor insertion, and anchor tightening.
    - c. Requirements for inspection or observation during installation.
  - 6. Qualification statements:
    - a. Post-installed anchors: Installer qualifications:
      - 1) Submit list of personnel performing installations and include date of manufacturer's training for each.

### 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - Post installed anchors shall be in accordance with building code specified in Division

     Regulatory Requirements.
  - 2. Installers: Post-installed mechanical anchors:
    - a. Installations shall be performed by trained installers having at least 3 years of experience performing similar installations with similar types of anchors.
- B. Special inspection:
  - 1. Provide special inspection of post-installed anchors as specified in Division 1 Special Tests and Inspections and this Section.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver post-installed anchors in manufacturer's standard packaging with labels visible and intact. Include manufacturer's installation instructions.
- B. Handle and store anchors and fasteners in accordance with manufacturer's recommendations and as required to prevent damage.
- C. Protect anchors from weather and moisture until installation.

### 1.07 PROJECT CONDITIONS

A. Seismic Design Category (SDC) for structures is indicated on the Drawings.

# PART 2 PRODUCTS

# 2.01 MANUFACTURED UNITS

- A. General:
  - 1. Furnish threaded fasteners with flat washers and hex nuts fabricated from materials corresponding to the material used for threaded portion of the anchor.
    - a. Cast-in anchors: Provide flat washers and nuts as listed in the ASTM standard for the anchor materials specified.
    - b. Post-installed anchors: Provide flat washers and nuts supplied for that product by the manufacturer of each anchor.
  - 2. Size of anchors and fasteners, including diameter and length or minimum effective embedment depth: As indicated on the Drawings or as specified in this Section. In the event of conflicts, contact Engineer for clarification.
  - 3. Where anchors and connections are not specifically indicated on the Drawings or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.

# B. Materials:

1. Provide and install anchors of materials as in this Section.

#### 2.02 CAST-IN ANCHORS AND FASTENERS

- A. Anchor bolts:
  - 1. Description:

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- a. Straight steel rod having one end with an integrally forged head, and one threaded end. Embedded into concrete with the headed end cast into concrete at the effective embedment depth indicated on the Drawings or specified, and with the threaded end left to project clear of concrete face as required for the connection to be made.
- b. Furnish anchor bolts with heavy hex forged head or equivalent acceptable to Engineer.
  - 1) Rods or bars with angle bend for embedment in concrete (i.e., "L" or "J" shaped anchor bolts) are not permitted in the Work.
- 2. Materials:
  - a. Ship anchor bolts with properly fitting nuts attached.
  - b. Type 316 stainless steel:
    - 1) Bolts: ASTM F593, Group 2, Condition CW, coarse threads.
    - 2) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of bolts.
    - **3)** Washers: Type 316 stainless steel.
- B. Anchor rods:
  - 1. Description: Straight steel rod having threads on each end[ or continuously threaded from end to end]. One threaded end is fitted with nuts or plates and embedded in concrete to the effective depth indicated on the Drawings, leaving the opposite threaded end to project clear of the concrete face as required for the connection to be made at that location.
  - 2. Materials:
    - a. Stainless steel: Type 316:
      - 1) Rod: ASTM F593, Group 2, Condition CW, coarse threads.
      - 2) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of rods.
      - **3)** Washers: Type 316 stainless steel.
      - 4) Plates (embedded): ASTM A240.
- C. Welded studs:
  - 1. Description: Anchor with forged head for embedment into concrete on one end, and welding ferrule for attachment to steel on the other. Welded to steel members or plates to provide anchorage for steel connections to concrete.
  - 2. Acceptance criteria:
    - a. Welded studs in accordance with AWS D1.1, Type B.
  - 3. Manufacturers: One of the following or equal:
    - a. Nelson Stud Welding Co., H4L Concrete Anchors or S3L Shear Connectors as indicated on the Drawings.
    - b. Stud Welding Products, Headed Concrete Anchors (HCA) or Headed Shear Connectors (HSC) as indicated on the Drawings.
  - 4. Materials:
    - a. Stainless steel: Type 316L:
- D. Steel plates or shapes for fabrications including assemblies with welded studs or deformed bar anchors:
  - 1. Stainless steel: Type 316L or Type 304L:
    - a. Plates (embedded): ASTM A240.

### 2.03 POST-INSTALLED ANCHORS AND FASTENERS - ADHESIVE

- A. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in concrete: As specified in Section 03260 Adhesive-Bonded Reinforcing Bars and All Thread Rods in Concrete.
- B. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in masonry: with approved epoxy and procedure .

# 2.04 POST-INSTALLED ANCHORS AND FASTENERS - MECHANICAL

# A. General:

- Post-installed anchors used for the Work shall hold a current ICC Evaluation Service Report demonstrating acceptance for use under the building code specified in Division 1 - Regulatory Requirements
  - a. Conditions of use: The acceptance report shall indicate acceptance of the product for use under the following conditions:
    - 1) In regions of concrete where cracking has occurred or may occur.
    - 2) To resist short-term loads due to wind forces.
    - 3) To resist short-term loading due to seismic forces for the Seismic Design Category of the structure where the product will be used.
- 2. Substitutions: When requesting product substitutions, submit calculations, indicating the diameter, effective embedment depth and spacing of the proposed anchors, and demonstrating that the substituted product will provide load resistance that is equal to or greater than that provided by the anchors listed in this Section.
  - a. Calculations shall be prepared by and shall bear the signature and seal of a Professional Engineer licensed in the State of Missouri.
  - b. Decisions regarding the acceptability of proposed substitutions shall be at the discretion of the Engineer.
- B. Concrete anchors:
  - 1. Description. Post-installed anchor assembly consisting of a threaded stud and a surrounding wedge expansion sleeve that is forced outward by torquing the center stud to transfer loads from the stud to the concrete through bearing, friction, or both. (Sometimes referred to as "expansion anchors" or "wedge anchors.")
    - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials to develop holding power.
  - 2. Concrete anchors for anchorage to concrete:
    - a. Acceptance criteria:
      - Concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
      - 2) Concrete anchor performance in the current ICC-ES Report shall be "Category 1" as defined in ACI 355.2.
    - b. Manufacturers: One of the following or equal:
      - 1) Hilti, Kwik Bolt TZ Expansion Anchor.
      - 2) Powers Fasteners, PowerStud+ SD2.
      - 3) Simpson Strong-Tie, Strong Bolt 2 Wedge Anchor.
    - c. Materials. Integrally threaded stud, wedge, washer, and nut:

- 1) Stainless steel: Type 316.
- Concrete anchors for anchorage to concrete masonry (fully grouted cells):
  - a. Acceptance criteria: Concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified in accordance with ICC-ES AC01, including all mandatory tests and optional seismic tests.
  - b. Manufacturers: One of the following or equal:
    - 1) Hilti, Kwik Bolt 3 Expansion Anchor.
    - 2) Powers Fasteners, Power-Stud+ SD1.
    - 3) Simpson Strong-Tie, Wedge-All Anchor.
    - Materials. Integrally threaded stud, wedge, washer, and nut:
      - 1) Stainless steel: Type 316.
- C. Flush shells:

C.

3.

- 1. Description: Post-installed anchor assembly consisting of an internally threaded mandrel that is forced into a pre-drilled concrete hole with a setting tool until the top of the anchor is flush with the face of the concrete. Once installed, a removable threaded bolt is installed in the mandrel.
- 2. Flush shell anchors are NOT permitted in the Work.

# PART 3 EXECUTION

# 3.01 EXAMINATION

- A. Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.
- 3.02 INSTALLATION: GENERAL
  - A. Where anchors and fasteners are not specifically indicated on the Drawings or specified, make attachments with materials specified in this Section.
  - B. Substitution of anchor types:
    - 1. Post-installed anchors may not be used as an alternative to cast-in/built-in anchors at locations where the latter are indicated on the Drawings.
    - 2. Cast-in/built-in anchors may be used as an alternative to post-installed mechanical anchors at locations where the latter are indicated on the Drawings.
  - C. Protect products from damage during installation. Take special care to protect threads and threaded ends.
  - D. Accurately locate and position anchors and fasteners:
    - 1. Unless otherwise indicated on the Drawings, install anchors perpendicular to the surfaces from which they project.
    - 2. Install anchors so that at least 2 threads, but not more than 1/2 inch of threaded rod, projects past the top nut.
  - E. Interface with other products:
    - 1. Where steel anchors come in contact with dissimilar metals (aluminum, stainless steel, etc.), use stainless steel anchors and separate or isolate dissimilar metals using isolating sleeves and washers.
2. Prior to installing nuts, coat threads of stainless steel fasteners with thread coating to prevent galling of threads.

# 3.03 INSTALLATION: CAST-IN ANCHORS

- A. General:
  - 1. Accurately locate cast-in and built-in anchors.
    - a. Provide anchor setting templates to locate anchor bolts and anchor rods. Secure templates to formwork.
    - b. Brace or tie off embedments as necessary to prevent displacement during placement of plastic concrete or of surrounding masonry construction.
    - c. Position and tie cast-in and built-in anchors in place before beginning placement of concrete or grout. Do not "stab" anchors into plastic concrete, mortar, or grout.
    - d. Do not allow cast-in anchors to touch reinforcing steel. Where cast-in anchors are within 1/4 inch of reinforcing steel, isolate the metals by wrapping the anchors with a minimum of 4 wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.
  - 2. For anchoring at machinery bases subject to vibration, use 2 nuts, with 1 serving as a locknut.
  - 3. Where anchor bolts or anchor rods are indicated on the Drawings as being for future use, thoroughly coat exposed surfaces that project from concrete or masonry with non-oxidizing wax. Turn nuts down full length of the threads, and neatly wrap the exposed thread and nut with a minimum of 4 wraps of 10-mil waterproof polyvinyl tape.
- B. Anchor bolts:
  - 1. Minimum effective embedment: 10-bolt diameters, unless a longer embedment is indicated on the Drawings.
  - 2. Where indicated on the Drawings, set anchor bolts in plastic, galvanized steel or stainless steel sleeves to allow for adjustment. Seal top of sleeve to prevent grout from filling sleeve
- C. Anchor rods:
  - 1. Install as specified for anchor bolts.

# 3.04 INSTALLATION: POST-INSTALLED ADHESIVE ANCHORS

- A. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in concrete: As specified in Section 03260 Adhesive-Bonded Reinforcing Bars and All Thread Rods in Concrete.
- B. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in masonry: based on approval.

# 3.05 INSTALLATION: POST-INSTALLED MECHANICAL ANCHORS

- A. General:
  - 1. Install anchors in accordance with the manufacturer's instructions, ACI 355.2, the anchor's ICC-ES Report. Where conflict exists between the ICC-ES Report and the requirements in this Section, the requirements of the ICC-ES Report shall control.
  - 2. Where anchor manufacturer recommends the use of special tools and/or specific drill bits for installation, provide and use such tools.
  - 3. After anchors have been positioned and inserted into concrete or masonry, do not:

- a. Remove and reuse/reinstall anchors.
- b. Loosen or remove bolts or studs.
- B. Holes drilled into concrete and masonry:
  - 1. Do not drill holes in concrete or masonry until the material has achieved its minimum specified compression strength (f'c or f'm).
  - 2. Accurately locate holes:
    - **a**. Before drilling holes, use a reinforcing bar locator to identify the position of all reinforcing steel, conduit, and other embedded items within a 6-inch radius of each proposed hole.
    - b. If the hole depth exceeds the range of detection for the rebar locator, the Engineer may require radiographs of the area designated for investigation before drilling commences.
  - 3. Exercise care to avoid damaging existing reinforcement and other items embedded in concrete and masonry.
    - a. If embedments are encountered during drilling, immediately stop work and notify the Engineer. Await Engineer's instructions before proceeding.
  - 4. Unless otherwise indicated on the Drawings, drill holes perpendicular to the concrete surface into which they are placed.
  - 5. Drill using anchor manufacturer's recommended equipment and procedures:
    - a. Unless otherwise recommended by the manufacturer, drill in accordance with the following:
      - 1) Drilling equipment: Electric or pneumatic rotary type with light or medium impact. Where edge distances are less than 2 inches, use lighter impact equipment to prevent micro-cracking and concrete spalling during drilling process.
      - 2) Drill bits: Carbide-tipped in accordance with ANSI B212-15. Hollow drills with flushing air systems are preferred.
  - 6. Drill holes at manufacturer's recommended diameter and to depth required to provide the effective embedment indicated.
  - 7. Clean and prepare holes as recommended by the manufacturer and as required by the ICC-ES Report for that anchor.
    - a. Unless otherwise recommended by anchor manufacturer, remove dust and debris using brushes and clean compressed air.
    - b. Repeat cleaning process as required by the manufacturer's installation instructions.
    - c. When cleaning holes for stainless steel anchors, use only stainless steel or nonmetallic brushes.
- C. Insert and tighten (or torque) anchors in full compliance with the manufacturer's installation instructions.
  - 1. Once anchor is tightened (torque), do not attempt to loosen or remove its bolt or stud.
- D. Concrete anchors: Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Concrete Anchors					
	Minimum Effective Embedment Length		Minimum Member		
Nominal Diameter	In Concrete	In Grouted Masonry	Thickness		
3/8 inch	2 1/2 inch	2 5/8 inch	8 inch		
1/2 inch	3 1/2 inch	3 1/2 inch	8 inch		
5/8 inch	4 1/2 inch	4 1/2 inch	10 inch		
3/4 inch	5 inch	5 1/4 inch	12 inch		

# E. Flush shell anchors:

- 1. Flush shell anchors are not permitted in the Work.
- 2. If equipment manufacturer's installation instructions recommend the use of flush shell anchors, contact Engineer for instructions before proceeding.

# 3.06 FIELD QUALITY CONTROL

- A. Contractor shall provide quality control over the Work of this Section as specified in Division 1 Quality Requirements.
  - 1. Expenses associated with work described by the following paragraphs shall be paid by the Contractor.
- B. Post-installed anchors:
  - 1. Review anchor manufacturer's installation instructions and requirements of the Evaluation Service Report (hereafter referred to as "installation documents") for each anchor type and material.
  - 2. Observe hole-drilling and cleaning operations for conformance with the installation documents.
  - 3. Certify in writing to the Engineer that the depth and location of anchor holes, and the torque applied for setting the anchors conforms to the requirements of the installation documents.

# 3.07 FIELD QUALITY ASSURANCE

- A. Owner's Representative will provide on-site observation and field quality assurance for the Work of this Section.
  - 1. Expenses associated with work described by the following paragraphs shall be paid by the Owner.
- B. Field inspections and special inspections:
  - 1. Required inspections: Observe construction for conformance to the approved Contract Documents, the accepted submittals, and manufacturer's installation instructions for the products used.
  - 2. Record of inspections:
    - a. Maintain record of each inspection.
    - b. Submit copies to Engineer upon request.
  - 3. Statement of special inspections: At the end of the project, prepare and submit to the Engineer and the authority having jurisdiction inspector's statement that the Work was constructed in general conformance with the approved Contract Documents, and that deficiencies observed during construction were resolved.

- C. Special inspections: Anchors cast into concrete and built into masonry.
  - 1. Provide special inspection during positioning of anchors and placement of concrete or masonry (including mortar and grout) around the following anchors:
    - a. Anchor bolts.
    - b. Anchor rods.
    - c. Welded studs.
  - 2. During placement, provide continuous special inspection at each anchor location to verify that the following elements of the installation conform to the requirements of the Contract Documents.
    - a. Anchor:
      - 1) Type and dimensions.
      - 2) Material: Galvanized steel, Type 304 stainless steel, or Type 316 stainless steel as specified in this Section or indicated on the Drawings.
      - 3) Positioning: Spacing, edge distances, effective embedment, and projection beyond the surface of the construction.
      - 4) Reinforcement at anchor: Presence, positioning, and size of additional reinforcement at anchors indicated on the Drawings.
  - 3. Following hardening and curing of the concrete or masonry surrounding the anchors, provide periodic special inspection to observe and confirm the following:
    - a. Base material (concrete or grouted masonry):
      - 1) Solid and dense concrete or grouted masonry material within required distances surrounding anchor.
      - 2) Material encapsulating embedment is dense and well-consolidated.
- D. Special Inspections: Post-installed mechanical anchors placed in hardened concrete and in grouted masonry.
  - 1. Provide special inspection during installation of the following anchors:
    - a. Concrete anchors.
  - 2. Unless otherwise noted, provide periodic special inspection during positioning, drilling, placing, and torquing of anchors.
    - a. Provide continuous special inspection for post-installed anchors in "overhead installations" as defined in this Section.
  - 3. Requirements for periodic special inspection:
    - a. Verify items listed in the following paragraphs for conformance to the requirements of the Contract Documents and the Evaluation Report for the anchor being used. Observe the initial installation of each type and size of anchor, and subsequent installation of the same anchor at intervals of not more than 4 hours.
      - Any change in the anchors used, in the personnel performing the installation, or in procedures used to install a given type of anchor shall require a new "initial inspection."
    - b. Substrate: Concrete or masonry surfaces receiving the anchor are sound and of a condition that will develop the anchor's rated strength.
    - c. Anchor:
      - 1) Manufacturer, type, and dimensions (diameter and length).
      - 2) Material (galvanized, Type 304 stainless steel, or Type 316 stainless steel).
    - d. Hole:
      - 1) Positioning: Spacing and edge distances.
      - 2) Drill bit type and diameter.
      - 3) Diameter, and depth.
      - 4) Hole cleaned in accordance with manufacturer's required procedures. Confirm multiple repetitions of cleaning when recommended by the manufacturer.

- 5) Anchor's minimum effective embedment.
- 6) Anchor tightening/installation torque.
- 4. Requirements for continuous special inspection:
  - a. The special inspector shall observe all aspects of anchor installation, except that holes may be drilled in his/her absence provided that he/she confirms the use of acceptable drill bits before drilling, and later confirms the diameter, depth, and cleaning of drilled holes.
- E. Field tests:
  - 1. Owner's Representative may, at any time, request testing to confirm that materials being delivered and installed conform to the requirements of the Specifications.
    - a. If such additional testing shows that the materials do not conform to the specified requirements, the Contractor shall pay the costs of these tests.
    - b. If such additional testing shows that the materials do conform to the specified requirements, the Owner shall pay the costs of these tests.
  - 2. Field testing: Post-installed anchors:
    - a. Proof load testing:
      - In addition to performing special inspections, the Owner's Representative may select up to 10 percent of each type and size of post-installed mechanical anchor for proof-load testing for pullout or shear. Tests shall be non-destructive whenever possible.
      - 2) Perform tension testing in accordance with ASTM E488. Apply proof loads using a calibrated hydraulic ram.
    - b. Torque load testing:
      - 1) Using a calibrated torque wrench, apply manufacturer's recommended installation torque.
    - c. Acceptance criteria:
      - 1) Minimum anchor embedment, proof load for pullout and shear, and torque shall be as specified in this Section.
      - 2) Anchors that fail to resist their designated proof load or installation torque requirements shall be regarded as non-performing.
      - 3) If more than 10 percent of the tested anchors fail to achieve their specified torque or proof load, all anchors of the same diameter and type as the failed anchors shall be tested.
      - 4) Remediate non-performing anchors as specified in "non-conforming work."

# 3.08 NON-CONFORMING WORK

- A. Remove misaligned or non-performing anchors.
- B. If more than 10 percent of all tested anchors of a given diameter and type fail to achieve their specified torque or proof load, the Engineer will provide directions for required modifications. Make such modifications, up to and including replacement of all anchors, at no additional cost to the Owner.

# 3.09 SCHEDULES

- A. Stainless steel. Provide and install stainless steel anchors at the following locations:
  - 1. "Corrosive locations" as defined in this Section: Type 316 stainless steel.
  - 2. "Wet and moist locations" as defined in this Section: Type 316 stainless steel.

# END OF SECTION

# SECTION 05500 METAL FABRICATIONS

## PART 1 GENERAL

### 1.01 SUMMARY

- A. Section includes:
  - 1. Aluminum grating stair tread.
  - 2. Aluminum stair nosing.
  - 3. Handrails and guardrails.
  - 4. Concrete inserts.
  - 5. Manhole frames and covers.
  - 6. Metal gratings.
  - 7. Metal tread plate.
  - 8. Preformed channel pipe supports.
  - 9. Stairs.
  - 10. Miscellaneous metals.
  - 11. Associated accessories to the above items.

## 1.02 REFERENCES

- A. Aluminum Association (AA):
  - DAF-45: Designations from Start to Finish.
     a. M12-C22-A41.
- B. American Association of State Highway and Transportation Officials (AASHTO):
   1. Standard Specifications for Highway Bridges.
- C. ASTM International (ASTM):
  - 1. A36 Standard Specification for Carbon Structural Steel.
  - 2. A48 Standard Specification for Gray Iron Castings.
  - 3. A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless.
  - 4. A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 5. A240 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels for General Applications.
  - 6. A276 Standard Specification for Stainless Steel Bars and Shapes.
  - 7. A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - 8. A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - 9. A380 Standard Practice for Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems.
  - 10. A489 Standard Specification for Carbon Steel Lifting Eyes.
  - 11. A490 Standard Specification for Structural Bolts, Alloy Steel, Heat-Treated, 150 ksi Minimum Tensile Strength.
  - 12. A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 13. A501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

- 14. A635 Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
- 15. A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 16. A992 Standard Specification for Structural Steel Shapes.
- 17. B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- 18. B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- 19. B308 Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
- 20. B429 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
- 21. F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
- D. American Welding Society (AWS):
  - 1. A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
  1. Metal Finishes Manual.
- F. Occupational Safety and Health Administration (OSHA).
- G. ANSI A14.3 Ladders, Fixed, Safety Requirements.
- H. ISO 9001:2000 Quality Management Systems Requirements.

## 1.03 DEFINITIONS

A. Passivation: Removal of exogenous iron or iron compounds from the surface of a stainless steel by means of chemical dissolution resulting from treatment with an acid solution that removes the surface contamination but does not significantly affect the stainless steel itself.

# 1.04 SUBMITTALS

- A. Product Data:
  - 1. Manufacturer's data sheets on each product to be installed, including model number, material, and finish.
- B. Shop drawings:
  - 1. Manufacturer's shop drawings indicating elevations, dimensions, connections, and size and type of fasteners.
    - a. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
    - b. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Quality control submittals:
  - 1. Design data.
  - 2. Regulatory Requirements: Submit certificate indicating compliance with ANSI A14.3.
  - 3. Manufacturer Qualifications: Provide products from a company which is ISO 9001 Registered.
  - 4. Test reports:

- a. Guardrails: 3 copies of certified tests performed by an independent testing laboratory certifying that guardrails meet current State and OSHA strength requirements.
- b. Gratings:
  - 1) Grating manufacturers' calculations showing that gratings will meet specified design load, stress, and deflection requirements for each size grating for each span.
  - 2) Reports of tests performed.

## PART 2 PRODUCTS

## 2.01 MATERIALS

A. General: Unless otherwise specified or indicated on the Drawings, structural and miscellaneous metals in accordance with the standards of the ASTM, including the following:

	ASTM	Class, Grade				
Item	Standard No.	Type or Alloy No.				
Cast Iron						
Cast Iron	A48	Class 40B				
Steel						
Galvanized sheet iron or steel	A653	Coating G90				
Coil (plate)	A635					
Structural plate, bars, rolled shapes, and miscellaneous items (except W shapes).	A36					
Rolled W shapes	A992	Grade 50				
Standard bolts, nuts, and washers	A307					
High strength bolts, nuts, and hardened flat	A325					
washers	A490					
Eyebolts	A489	Type 1				
Tubing, cold-formed	A500					
Tubing, hot-formed	A501					
Steel pipe	A53	Grade B				
Stainless Steel						
Plate, sheet, and strip	A240	Type 304* or 316**				
Bars and shapes	A276	Type 304* or 316**				
Bolts (Type 304)	F593	Group 1 Condition CW				
Bolts (Type 316)	F593	Group 2 Condition CW				

	ASTM	Class, Grade			
Item	Standard No.	Type or Alloy No.			
Aluminum					
Flashing sheet aluminum	B209	Alloy 5005-H14, 0.032 inches minimum thickness			
Structural sheet aluminum-	B209	Alloy 6061-T6			
Structural aluminum	B209 B308	Alloy 6061-T6			
Extruded aluminum	B221	Alloy 6063-T42			
* Use Type 304L if material will be welded.					

\*\* Use Type 316L if material will be welded.

- 1. Stainless steels are designated by type or series defined by ASTM.
- 2. Where stainless steel is welded, use low-carbon stainless steel.

## 2.02 MANUFACTURED UNITS

1.

- A. Aluminum grating stair tread:
  - Manufacturers: One of the following or equal:
    - a. IKG Borden Ind., Aluminum Grating Stair Tread with Mebac® nosing.
    - b. McNichols Co., Type A-Standard with Corrugated Angle Nosing.
  - 2. Material: Welded aluminum grating tread with non-slip nosing and integral end plates for bolt on attachment to stair stringers.
  - 3. Size:
    - a. Tread width: To equal tread spacing plus 1 inch minimum.
    - b. Tread length: Length to suit stringer-to-stringer dimension on the Drawings.
    - c. Depth: 1-3/4 inches.
  - 4. Bolts: Type 316 stainless steel.
- B. Aluminum stair nosing:
  - 1. Manufacturers: One of the following or equal:
    - a. Wooster Products, Inc., Type 101 Nosing.
    - b. American Safety Tread Co., Inc., Style 801 Nosing.
  - 2. Material: Cast aluminum abrasive nosings with aluminum oxide granules integrally cast into metal, forming permanent, nonslip, long-wearing surface.
  - 3. For installation in cast-in-place stairs.
  - 4. Configuration: 4 inches wide, fabricated with integrally cast stainless steel anchors at approximately 12-inch centers. Length to extend within 3 inches of stair edge on each side.
- C. Handrails and guardrails:
  - 1. General:
    - a. Design and fabricate assemblies to conform to current local, State, and OSHA standards and requirements.
    - b. Coordinate layout of assemblies and post spacings to avoid conflicts with equipment and equipment operators:
      - 1) Indicate on the shop drawings locations of such equipment.

- 2) Highlight locations where railings cannot be made continuous, and obtain Engineer's directions on how to proceed before fabricating or installing railings.
- 2. Aluminum handrails and guardrails (nonwelded pipe):
  - Rails, posts, and fitting-assembly spacers:
    - 1) In accordance with ASTM B429, 6005, 6063 or 6105, minimum Schedule 40, extruded aluminum pipe of minimum 1.89-inch outside diameter and 0.14-inch wall thickness.
  - b. Kick plates: 6061 or 6105 aluminum alloy.
  - c. Fastenings and fasteners: As recommended or furnished by the manufacturer.
  - d. Other parts: 6063 extruded aluminum, or F214 or F514.0 aluminum castings:
    - 1) Fabrications: In accordance with ASTM B209 or ASTM B221 extruded bars:
      - a) Bases: 6061 or 6063 extruded aluminum alloy.
    - 2) Plug screws or blind rivets: Type 305 stainless steel.
      - a) Other parts: Type 300 series stainless steel.
  - e. Finish of aluminum components:
    - 1) Anodized finish, 0.7 mil thick, applied to exposed surfaces after cutting. Aluminum Association Specification M12-C22-A41, mechanical finish non specular as fabricated, chemical finish-medium matte, anodic coating-clear Class I Architectural.
    - 2) Pretreat aluminum for cleaning and removing markings before anodizing.
  - f. Fabrication and assembly:
    - 1) Fabricate posts in single, unspliced pipe length.
    - 2) Perform without welding.
    - 3) Do not epoxy bond the parts.
    - 4) Maximum clear opening between assembled railing components as indicated on the Drawings.
  - g. Manufacturers: One of the following or equal:
    - 1) Moultrie Manufacturing Co., Wesrail.
    - 2) Golden Railings, Riveted System.
    - 3) Craneveyor Corp. Enerco Metals, C-V Rail.
- D. Manhole frames and covers:
  - 1. Material: Gray iron castings, in accordance with ASTM A48, Class 30-B.
  - 2. Type: Heavy-duty traffic type, with combined minimum set weight of 265 pounds.
  - 3. Machine horizontal and vertical bearing surfaces to fit neatly, with easily removable cover bearing firmly in frame without rocking.
  - 4. Frame:

a.

- a. Bottom flange type.
- b. Approximately 4-1/2 inches frame height.
- c. Dimensions as indicated on the Drawings.
  - 1) Minimum inside clear dimension may not be smaller than nominal diameter minus 2 inches.
- 5. Cover:
  - a. Skid-resistant grid pattern design stamped with name of utility service provided by manhole, such as "ELECTRICAL," "SEWER," "TELEPHONE," or "WATER."
  - b. Solid type without ventilation holes.
- 6. Finish: Unpainted.
- E. Metal gratings:

- 1. General:
  - a. Fabricate grating to cover areas indicated on the Drawings.
  - b. Unless otherwise indicated on the Drawings, grating over an opening shall cover entire opening.
  - c. Make cutouts in grating where required for equipment access or protrusion, including valve operators or stems, and gate frames.
  - d. Band ends of grating and edges of cutouts in grating:
    - 1) End banding: 1/4 inch less than height of grating, with top of grating and top edge of banding flush.
    - 2) Cutout banding: Full-height of grating.
    - 3) Use banding of same material as grating.
    - 4) Panel layout: Enable installation and subsequent removal of grating around protrusions or piping.
    - 5) Openings 6 inches and larger: Lay out grating panels with edges of 2 adjacent panels located on centerline of opening.
    - 6) Openings smaller than 6 inches: Locate opening at edge of single panel.
    - 7) Where an area requires more than 1 grating section to cover area, clamp adjacent grating sections together at 1/4-points with fasteners acceptable to Engineer.
    - 8) Fabricate steel grating sections in units weighing not more than 50 pounds each.
    - 9) Fabricate aluminum grating sections in units of weighing not more than 50 pounds each.
    - 10) Gaps between adjacent grating sections shall not be more than the clear spacing between bearing bars.
  - e. When requested by Engineer, test 1 section of each size grating for each span length involved on the job under full load:
    - 1) Furnish a suitable dial gauge for measuring deflections.
  - f. Grating shall be aluminum, unless otherwise specified or indicated on the Drawings.
- 2. Aluminum grating:
  - a. Material for gratings, shelf angles, and rebates: 6061-T6 or 6063-T6 aluminum alloy, except crossbars may be 6063-T5 aluminum alloy.
  - b. Shelf angle concrete anchors: Type 304 or Type 316 stainless steel.
  - c. Grating rebate rod anchors: 6061-T6 or 6063-T6 aluminum alloy.
  - d. Bar size and spacing: As determined by manufacturer to enable grating to support design load.
  - e. Design live load: A minimum of 100 pounds per square foot uniform live load on entire grating area, but not less than the live load indicated on the Drawings for the area where grating is located.
  - f. Maximum fiber stress for design load: 12,000 pounds per square inch.
  - g. Maximum deflection due to design load: 1/240 of grating clear span.
  - h. Maximum spacing of main grating bars: 1-1/8 inches clear between bars.
  - i. Minimum grating height: 1-1/2 inches.
  - j. Manufacturers: One of the following or equal:
    - 1) IKG Borden Ind., Grooved aluminum I-bar.
    - 2) Brodhead Steel Products, Inc., Grooved aluminum I-bar.
- 3. Heavy-duty steel grating:
  - a. Heavy-duty type, fabricated from structural steel and designed in accordance with AASHTO Standard Specifications for Highway Bridges, using H-20 loading.
  - b. Hot-dip galvanized after fabrication in accordance with ASTM A123.
  - c. Manufacturers: One of the following or equal:

- 1) Reliance Steel Products Co., Heavy-Duty Steel Grating.
- F. Metal tread plate:
  - 1. Plate having a raised figured pattern on 1 surface to provide improved traction.
- G. Preformed channel pipe supports:
  - 1. Preformed channel pipe supports for pipe supports and other applications as per standard Preformed Channel Pipe Support System.
- H. Stairs:
  - 1. Aluminum stairs:
    - a. Stringers: 6061-T6 aluminum alloy.
    - b. Stair treads:
      - 1) Aluminum of same type specified under Aluminum Grating.
      - 2) Of sizes indicated on the Drawings, and 1-3/4-inch minimum depth with cast abrasive type safety nosings.
    - c. Handrails and guardrails: Aluminum pipe specified under Aluminum Handrails and Guardrails (Nonwelded Pipe).
    - d. Fasteners: Type 304 or Type 316 stainless steel.
- I. Miscellaneous aluminum:
  - 1. Fabricate aluminum products, not covered separately in this Section, in accordance with the best practices of the trade and field assemble by riveting or bolting.
  - 2. Do not weld or flame cut.
- J. Miscellaneous cast iron:
  - 1. General:
    - a. Tough, gray iron, free from cracks, holes, swells, and cold shuts.
    - b. Quality such that hammer blow will produce indentation on rectangular edge of casting without flaking metal.
    - c. Before leaving the foundry, clean castings and apply 16-mil dry film thickness coating of coal-tar epoxy, unless otherwise specified or indicated on the Drawings.
- K. Miscellaneous stainless steel:
  - 1. Provide miscellaneous stainless-steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
    - a. Fabricate and install in accordance with the best practices of the trade.
  - 2. Cleaning and passivation:
    - a. Following shop fabrication of stainless steel members, clean and passivate fabrications.
    - b. Finish requirements: Remove free iron, heat tint oxides, weld scale and other impurities, and obtain a passive finished surface.
    - c. Provide quality control testing to verify effectiveness of cleaning agents and procedures and to confirm that finished surfaces are clean and passivated.
      - 1) Conduct sample runs using test specimens with proposed cleaning agents and procedures as required to avoid adverse effects on surface finishes and base materials.
    - d. Pre-clean, chemically descale (pickle), and final clean fabrications in accordance with the requirements of ASTM A380 to remove deposited contaminants before shipping.
      - 1) Passivation by citric acid treatment is not allowed.

- a) If degreasing is required before cleaning to remove scale or iron oxide, cleaning (pickling) treatments with citric acid are permissible; however, these treatments shall be followed by inorganic cleaners such as nitric-hydrofluoric acid.
- 2) Provide acid descaling (pickling) in accordance with Table A1.1 of Annex A1 of ASTM A380.
- After pickling, final cleaning of stainless steel shall conform to Part II of Table A2.1 of Annex A2 of ASTM A380.
- e. After cleaning, inspect using methods specified for "gross inspection" in ASTM A380.
- f. Improperly or poorly cleaned and passivated materials shall not be shipped and will not be accepted at the job site.
- L. Miscellaneous structural steel:
  - 1. Provide miscellaneous steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
    - a. Fabricate and install in accordance with the best practices of the trade.
- M. Isolating sleeves and washers:
  - 1. As indicated on the Drawings and as specified in Section 05090 Mechanical Anchoring and Fastening to Concrete and Masonry.

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verification of conditions:
  - 1. Examine work in place to verify that it is satisfactory to receive the work of this Section.
  - 2. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

# 3.02 INSTALLATION

- A. General:
  - 1. Install products as indicated on the Drawings, and in accordance with shop drawings and manufacturer's printed instructions, as applicable except where specified otherwise.
  - 2. Interface between materials:
    - a. Dissimilar metals:
      - 1) Where steel comes in contact with dissimilar metals (aluminum, stainless steel, etc.), separate or isolate the dissimilar metals.
      - 2) Where aluminum contacts a dissimilar metal, apply to the dissimilar a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint.
      - 3) Make application so that the isolating or protective barrier is not visible in the completed construction.
      - 4) Isolating sleeves and washers: As specified in Section 05090 Mechanical Anchoring and Fastening to Concrete and Masonry.
    - b. Where aluminum contacts masonry or concrete, apply a heavy coat of acceptable

- B. Aluminum stair nosing:
  - 1. Install stair nosings on treads of concrete stairs, including top tread on upper concrete slab.
  - 2. Omit stair nosings where concrete is submerged.
  - 3. Cast stair nosings in fresh concrete, flush with tread and riser faces. Install nosing in center of step approximately 3 inches from each stair edge.
- C. Handrails and guardrails:
  - 1. General:
    - a. Fasten pipe rails to fittings with Series 300 stainless steel pop rivets or flush set screws.
    - b. Make pipe cuts clean and straight, free of burrs and nicks, and square and accurate for minimum joint-gap.
    - c. Drill and countersink holes to proper size, as required for a tight flush fit of screws and other component parts.
    - d. Space attachment brackets as indicated in the manufacturer's instructions.
  - 2. Aluminum pipe handrails and guardrails:
    - a. During construction, keep exterior surfaces of handrails and guardrails covered with minimum 0.4 millimeters of heat shrink polyethylene film.
    - b. Do not remove protective film before handrails and guardrails have been accepted by Engineer nor before other work in proximity of handrails and guardrails has been completed.
    - c. Discontinue handrails and guardrails at lighting fixtures.
    - d. Provide 1/8-inch diameter weep hole at base of each post.
    - e. Space posts as indicated on the Drawings.
    - f. Anchor posts into concrete by grouting posts into formed holes in concrete, into stainless steel sleeves cast in concrete; or bracket mount to face of concrete surfaces as specified and indicated on the Drawings.
    - g. Space rails as indicated on the Drawings.
    - h. Make adequate provision for expansion and contraction of kick plates and rails.
      1) Make provisions for removable sections where indicated on the Drawings.
    - i. Make lower rails a single, unspliced length between posts, or continuous.
    - j. Make top rails continuous whenever possible, and attach single, unspliced lengths to 3 posts minimum.
    - k. Draw up fasteners tight with hand wrench or screw driver.
    - 1. Space attachment brackets as indicated on shop drawings or in manufacturer's installation instructions.
    - m. Completed installation shall have handrails and railings rigid and free of play at joints and attachments.
    - n. Protect handrail and guardrail finish from scratches, gouges, dents, stains, and other damage.
    - o. Replace damaged or disfigured handrails and guardrails with new.
    - p. Shortly before final acceptance of the work, and after removal of protective polyethylene film, clean handrails and guardrails with mild detergent or with soap and water.
      - 1) After cleaning, thoroughly rinse handrails and guardrails and wipe with soft cloth.
    - q. Erect guardrail straight, level, plumb, and true to the positions as indicated on the Drawings. Correct deviations from true line of grade, which are visible to the eye.
- D. Manhole frames and covers:
  - 1. Installation: As per manufactures specification.

- E. Metal gratings:
  - 1. General:
    - a. Allow 1/8-inch maximum clearance between ends of grating and inside face of vertical leg of shelf angles.
    - b. Horizontal bearing leg of shelf angles shall be 2 inches minimum.
    - c. Install aluminum plate or angles where necessary to fill openings at changes in elevation and at openings between equipment and grating.
    - d. Install angle stops at ends of grating.
    - e. Installed grating shall not slide out of rebate or off support.
    - f. Weld stops in place, unless otherwise specified or indicated on the Drawings.
    - g. Top surfaces of grating sections adjacent to each other shall lie in same plane.
  - 2. Aluminum grating:
    - a. Aluminum grating: Support on aluminum shelf angles or rebates.
  - 3. Heavy-duty steel grating:
    - a. Support on hot-dip galvanized structural steel rebates embedded and anchored in concrete.
- F. Stairs:
  - 1. General:
    - a. Install guard railings around stair wells as indicated on the Drawings or specified.
- G. Stainless Steel:
  - 1. Welding:
    - a. Passivate field-welded surfaces:
      - 1) Provide cleaning, pickling and passivating as specified in this Section.
      - 2) Clean using Derustit Stainless Steel Cleaner, or equal.

# 3.03 PROTECTION

A. Protect aluminum fabrications from damage due to work of adjacent trades.

# 3.04 CLEANING

- A. As work progresses, remove debris and leave installation sites broom clean.
- B. Prior to final acceptance, clean ladders of any paint, mud or other adherents.

# END OF SECTION

### SECTION 05515 ALUMINUM LADDERS AND ACCESSORIES

PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and provide complete ladders and accessories as shown on the Drawings and as specified herein.
- 1.02 RELATED WORK
  - A. Metal Fabrications are included in Section 05500.
- 1.03 SUBMITTALS
  - A. Submit, in accordance with Section 01300, manufacturer's shop drawings to indicate compliance with this Section. Show locations, methods of supporting, methods of anchoring and finishes.
- 1.04 REFERENCE STANDARDS
  - A. Occupational Safety and Health Administration (OSHA).
  - B. American National Standards Institute (ANSI):
    - 1. ANSI A14.3 Ladders, Fixed, Safety Requirements.
  - C. American Society for Testing and Materials (ASTM) Publications:
    - 1. ASTM B209 Aluminum and Aluminum-Alloy Sheet and Plate.
    - 2. ASTM B221 Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.
  - D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Extruded aluminum: ASTM B221, Alloy 6063 Temper T-6, non-spark.
- B. Sheet aluminum: ASTM B209 6063 Temper T-6.
- C. Finish: Mill finished aluminum.

## 2.02 CAGED ALUMINUM ACCESS LADDERS

- A. General:
  - 1. Comply with ANSI A14.3.
- B. Aluminum Ladders:
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Upnovr, Inc.; U-303 or a comparable product by one of the following:
    - a. O'Keeffe's Inc.
    - b. Precision Ladders, LLC.
  - 2. Source Limitations: Obtain aluminum ladders from single source from single manufacturer.
  - 3. Space siderails 24 inches apart unless otherwise indicated.
  - 4. Siderails: Continuous extruded-aluminum channels or tubes, not less than 3 inches deep, 1- 3/4 inch wide, and 1/8 inch thick. Extend side rails 42 inches above parapet platform. Provide rails on opposite side mounted to rear of parapet and extending 42 inches above parapet and below parapet to roof line.
  - 5. Grab bars: Connect front and rear side rails with 4 pairs of 1-1/4 inches square tube grab bars with corrugated surfaces.
  - 6. Rungs: Extruded-aluminum tubes, not less than 1-1/4 inch deep and not less than 1/8 inch thick, with ribbed or corrugated tread surfaces and capable of 1,000 pounds load. Space rungs 12 inches o.c.
  - 7. Fit rungs in centerline of siderails; fasten by welding.
  - 8. Provide parapet crossover platform fabricated from extruded-aluminum plank grating with corrugated tread surfaces, supported by extruded-aluminum framing. Limit openings in gratings to no more than 1/2 inch in least dimension.
  - 9. Support each ladder at top and bottom and not more than 48 inches o.c. with welded or bolted aluminum brackets.
  - 10. Provide minimum 72-inch- (1830-mm-) high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use. Fabricate from 11 gauge flat aluminum sheet. Equip door with continuous stainless steel hinge.

# 2.03 LADDER SAFETY CAGES

- A. General:
  - 1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless steel fasteners.
  - 2. Provide primary hoops at tops and bottoms of cages. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.

- 3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless steel fasteners unless otherwise indicated.
- 4. Bottom loop radius: 17-1/2 inches.
- 5. Radius of other loops: 13-1/2 inches.
- 6. Minimum clearance from ladder to back of cage: 27 inches.
- 7. Extend safety cage 42 inches minimum above parapet platform and attach to side rails.
- B. Aluminum Ladder Safety Cages:
  - 1. Primary Hoops: 1/4-by-4-inch (6.4-by-100-mm) flat bar hoops.
  - 2. Secondary Intermediate Hoops: 1/4-by-2-inch (6.4-by-50-mm) flat bar hoops.
  - 3. Vertical Bars: Provide 7 equally spaced 1/4-by-2-inch (6.4-by-50-mm) flat bars secured to each hoop.

## 2.04 ACCESSORIES:

- A. Wall Brackets: 2 inch (50 mm) by 1/4 inch (6 mm) minimum flat bar aluminum wall brackets.
- B. Security Door: Hinged security door to cover bottom rungs and prevent unauthorized roof access. Fabricate from 11 gage flat aluminum sheet covering front of ladder. Provide side flanges extending toward wall and meeting aluminum flange mounted to wall. Equip door with continuous hinge and padlock hasp.

## PART 3 EXECUTION

- 3.01 INSTALLATION
  - A. Install ladders and accessories in compliance with manufacturer's shop drawings and detailed instructions.
  - B. Install fabrications, plumb, square and level and securely anchored to supports. Smooth and adjust miters and field cuts to assure tight joints.
  - C. Where aluminum contacts a dissimilar metal, apply to the dissimilar a heavy brush coat of zinc- chromate primer followed by two coats of aluminum metal and masonry paint.
  - D. Where aluminum contacts masonry or concrete, apply a heavy coat of acceptable alkali resistant bituminous paint to the masonry or concrete.

# 3.02 PROTECTION

A. Protect aluminum fabrications from damage due to work of adjacent trades.

# 3.03 CLEANING

- A. As work progresses, remove debris and leave installation sites broom clean.
- B. Prior to final acceptance, clean ladders of any paint, mud or other adherents.

## END OF SECTION

## SECTION 05520 METAL HANDRAILS AND GUARDRAILS

PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and provide complete handrails and guardrails including toeboards as shown on the Drawings and as specified herein.

#### 1.02 RELATED WORK

A. Metal Fabrications is included in Section 05500.

### 1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings prior to fabrication indicating rail layout, profiles, sizes of members, methods of assembly, attachments, anchorages, anchorage locations, sizes and types of fasteners, accessories and locations of expansion joints. Submittals shall include at least the following:
  - 1. Manufacturer's load table and test data demonstrating that the railings will resist the loads specified in Paragraph 1.05 below at the post spacings provided.
  - 2. Letter certifying that railing system is in compliance with local building code and OSHA requirements.
  - 3. Letter of guarantee as required in Paragraph 1.08 below.
  - 4. Twelve-in long samples of handrail and guardrail. Submit one samples of elbow, tee, wall bracket, escutcheon, end stop, and rail joint connections.

## 1.04 REFERENCE STANDARDS

- A. Aluminum Association (AA)
  - 1. Standard Specifications as referenced.
- B. Occupational Safety and Health Administration (OSHA).

- C. International Conference of Building Officials (ICBO)
  - 1. Uniform Building Code (UBC)
- D. Building Officials and Code Administrations Congress, Inc. (BOCA)
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.05 QUALITY ASSURANCE

- A. The railing assembly including rails, posts, attachments and anchors shall be adequate to resist the following forces without damages or permanent set. Apply each load so as to produce the maximum stress in each of the railing components. The concentrated and uniform loading conditions need to be applied simultaneously.
  - 1. Handrails
    - a. A concentrated load of 200 lbs applied at any point and in any direction.
    - b. A uniform load of 50 lbs/ft applied at any point and in any direction.
  - 2. Guardrails
    - a. A concentrated load of 300 lbs applied at any point and in any direction along the top railing member.
    - b. A uniform load of 100 lbs/ft applied in any direction along the top railing member.
    - c. Infill area of guardrail system (including intermediate rails): A horizontal load of 200 lbs applied on a 1 sq ft area anywhere in the system.

## 1.06 PROJECT/SITE REQUIREMENTS

- A. Fully coordinate the work of this Section with that of other Sections. Verify at the site the dimensions and work of other trades adjoining or supporting the work of this Section prior to fabrication and installation.
- B. Take field measurements at the site to confirm and/or supplement indicated dimensions and to ensure proper fit of all components.
- C. Furnish to the appropriate trades all items specified under this Section and installed under other Sections.

## 1.07 DELIVERY, STORAGE AND HANDLING

A. Protect railings against scratching, splashes, mortar, paint and other damage using paper wrap, an approved coating, or both. Provide such protection during transportation, storage, erection and until adjacent work by other trades is complete.

## 1.08 WARRANTY

A. Provide a certificate of guarantee against defects in materials or workmanship for a period of 1 year or as required by the General Conditions Section of the project specifications whichever is greater following acceptance of work by the Engineer.

### 1.09 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Install anchors and/or post bases in concrete in compliance Manufacturer recommendation.
- B. Install anchors and/or post bases on miscellaneous metals in compliance with the requirements of this Section and pertinent sections in Division 5.

### 1.10 DEFINITIONS

- A. Guardrail: A protective railing adjacent to a change in height in a structure. Used also at the open sides of stairways.
- B. Handrail: A horizontal or sloped single rail system supported by balusters or wall brackets.

## PART 2 PRODUCTS

### 2.01 MECHANICALLY FASTENED ALUMINUM RAILING SYSTEM

- A. Manufacturer shall be an established manufacturer of a custom, pre-engineered, mechanically fastened handrail system which complies with the requirements of the Drawings and as specified herein. Shop fabricators or miscellaneous metal fabrications/suppliers will not be acceptable.
  - 1. Manufacturers
    - a. C-V Pipe Rail Crane Veyor Corp., South El Monte, CA
    - b. TABCO 2500 Series Rocky Mountain Railings, Denver, CO

#### B. Materials

- 1. Rails and Posts. 1-1/2-in extruded aluminum pipe having a maximum outside diameter of 2-in.
- 2. Splice and reinforcing sleeves, brackets, end caps, etc, shall be aluminum alloy 6063 or 6061. Cast fittings shall be aluminum alloy No. 214.
- 3. Fastening hardware shall be Type 316 stainless steel supplied by the handrail manufacturer.
- 4. Safety gates, fabricated extruded aluminum pipe as specified for rails and posts. Provide self-closing gate with aluminum or stainless steel hinges and a stainless steel spring closer and latch.
- 5. Safety chains where indicated on the Drawings or required shall be fabricated from a minimum 17/64-in diameter aluminum rod and attached to posts with stainless steel hooks. 3/16-in stainless steel chain may be used in lieu of aluminum.
- 6. Toeboards. Extruded 4-in channel-shaped/"S" plate for straight and 4-in flat bar for circular installations fabricated of aluminum alloy 6063-T6 as shown on the Drawings installed with not more than 1/4-in clearance above the floor level as prescribed by OSHA. Provide splice plates, corner splice connectors and connections to posts as shown on the Drawings and as required for installation.

7. All railing, posts and toeboards and exposed aluminum shall be anodized with an architectural Class I satin finish providing a minimum coating thickness of 0.7 mils and a minimum coating weight of 32 milligrams per square inch in compliance with AA M12C22A41. Color shall be Clear Satin.

## 2.02 WELDED ALUMINUM RAILING SYSTEM

A. A railing system employing welded aluminum pipe components will be considered for approval by the Engineer as an equal to the mechanical fastened system specified above. System shall comply with all requirements of OSHA and the applicable local building codes. Circumferential welds shall be ground smooth and even to produce a railing that is neat in appearance and structurally sound.

## 2.03 FABRICATION

- A. The railing system fabricator shall be responsible for design of a system adequate to conform to the requirements of OSHA, applicable local building codes and the detailed requirements of the Drawings and as specified herein.
- B. Post spacing shall not exceed that noted on the Drawings nor the requirements of OSHA nor a maximum of 8-ft-0-in on center. Provide uniform post spacing adequate to resist the loads specified in Paragraph 1.05 above. Shorter spacing may be used at ends of lines of railing when required to maintain uniform spacing along the line. Posts shall be provided at all ends and corners of runs when toeboards are provided.
- C. Railings shall be fabricated as a sub-assembled system. Posts shall be completely assembled except for the top fitting which may be field attached to the top rail. Rails and toeboards may be shipped in maximum 24-ft lengths to be field cut and attached to posts.
- D. Field splices and expansion joints shall have internal sleeves. Accurately form components to each other and to the structure with tightly fitted joints providing smooth transitions.
- E. Make provision for thermal movements of the rails and toeboards as noted on the Drawings. Provide expansion joints in at not more than 24-ft on center unless the manufacturer recommends a closer spacing.
- F. Make provisions for removable railing sections where shown on the Drawings.
- G. Pipe cuts shall be square and without burrs. Joints shall be neat and with minimum gap between adjoining segments. All fastener holes shall be unobtrusively located, drilled and countersunk to provide fasteners flush with the surface of the rail.
- H. Provide 3/16-in weep holes located 1/4-in to 3/4-in above the grout line for posts set in grout or concrete.
- I. Supply components required to anchor fabrications to the structures. Support handrails from structural members using approved sockets, flanges, brackets, or other means which provide neat and substantial support.
- J. All railing surfaces and anchorage systems in contact with concrete or dissimilar metals shall receive one applied coat of zinc chronate to a dry film thickness of 10 mils.

- K. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small uniform radius.
- L. For welded systems, continuously seal joined pieces by continuous welds.

## PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work prior to commencing installation.

## 3.02 PREPARATION

A. Supply items required to be cast into concrete, embedded in masonry, and/or placed in partitions with setting templates, to appropriate trades for installation under other Sections.

## 3.03 INSTALLATION

- A. Install railings in compliance with manufacturer's instructions.
- B. Install components plumb and in line, accurately fitted, free from distortion or defects and securely anchored to the structure.
- C. Provide anchors, plates, angles, etc, required for connecting railings to structure.
- D. Where handrail or guardrail posts are set in concrete the posts shall be set into PVC sleeves cast in the concrete. Firmly cement posts in place with 1651 epoxy resin E-Bond Epoxies, represented by Silcone Specialties Inc., Dallas, TX; Sikadur Hi-mod Sika Corporation, Lindhurst, NJ or equal. Place collars on the posts and fasten in place as detailed on approved shop drawings.
- E. Field weld anchors if indicated on Drawings, or shop drawings. Touch-up welds with primer. Grind welds smooth.
- F. Accurately cut rail and toeboard to be field-cut and attached to posts in full compliance with the manufacturer's instructions.

## 3.04 ERECTION TOLERANCES

- A. Maximum variation from plumb shall be 1/4-in.
- B. Maximum offset from true alignment for every 50-ft length of railing shall be 1/4-in, non-cumulative.

# END OF SECTION

### SECTION 09960 HIGH PERFORMANCE COATINGS

## PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and design and deliver highperformance coatings for the Project as shown on the Drawings and as specified herein.
- B. The work includes surface preparation and application of high-performance coating systems on the following substrates:
- C. Exterior Substrates:
  - 1. Steel.
  - 2. Galvanized metal.
- D. Interior Substrates:
  - 1. Concrete, vertical and horizontal surfaces.
  - 2. Steel.
  - 3. Galvanized metal.
  - 4. Ductile iron pipe.

### 1.02 SUBMITTALS

- A. Submit, in accordance with Section 01300.
- B. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- C. Samples for Initial Selection: For each type of topcoat product indicated.
- D. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.

- E. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

### 1.03 REFERENCE STANDARDS

- A. ASTM International
  - 1. ASTM D 523 Test Method for Specular Gloss
- B. Code of Federal Regulations
  - 1. 40 CFR 59, Subpart D-2002: National Volatile Organic Compound Emission Standards for Architectural Coatings
- C. Master Painters Institute
  - 1. MPI Approved Products List.
  - 2. MPI Architectural Painting Specification Manual.
- D. SSPC: The Society for Protective Coatings
  - 1. SSPC-PA 1 Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel
  - 2. SSPC-SP 5/NACE No. 1 Joint Surface Preparation Standard SSPC- SP 5/NACE No. 1: White Metal Blast Cleaning
  - 3. SSPC-SP 6/NACE No. 3 Joint Surface Preparation Standard SSPC- SP 6/NACE No. 3: Commercial Blast Cleaning
  - 4. SSPC-SP 7/NACE No. 4 Joint Surface Preparation Standard SSPC- SP 7/NACE No. 4: Brush-Off Blast Cleaning
  - SSPC-SP 10/NACE No. 2 Joint Surface Preparation Standard SSPC- SP 10/NACE No. 2: Near-White Blast Cleaning
  - 6. SSPC-SP 11 Surface Preparation Specification No. 11: Power Tool Cleaning to Bare Metal
- E. Where reference is made to one of the above or other referenced standards, the revisions in effect at the time of bid opening shall apply.

#### 1.04 DEFINITIONS

- A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

### 1.05 DELIVERY, STORAGE AND HANDLING

- A. 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.

## 1.06 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

# 1.07 EXTRA MATERIALS

- 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. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

# PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Manufacturers: Provide products by the following:
- B. Tnemec, Inc.
- C. Sherwin-Williams Company (The).
- D. Induron Coatings, Inc.
- E. Or equal.

## 2.02 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."
- B. Material Compatibility:
  - 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

- 2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
- 3. Provide products of same manufacturer for each coat in a coating system.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
  - 1. Flat Paints and Coatings: 50 g/L.
  - 2. Non-flat Paints and Coatings: 150 g/L.
  - 3. Primers, Sealers, and Undercoaters: 200 g/L.
  - 4. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
  - 5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
  - 6. Pre-Treatment Wash Primers: 420 g/L.
  - 7. Floor Coatings: 100 g/L.
  - 8. Shellacs, Clear: 730 g/L.
  - 9. Shellacs, Pigmented: 550 g/L.
- D. Colors: As selected by Engineer from manufacturer's full range.

## 2.03 BLOCK FILLERS, SURFACERS

- A. Block Filler, Latex, Interior/Exterior:
  - 1. Tnemec Company, Inc.; Series 130, EnviroFill.
- B. Surfacer, Epoxy:
  - 1. Tnemec Company, Inc.; Series 215, Surfacing Epoxy.
- C. Cementitious Repair Mortar:
  - 1. Tnemec Company, Inc.; Series 217, Mortarcrete.
- D. Epoxy Modified Cementitious Mortar:
  - 1. Tnemec Company, Inc.; Series 218-1000, Mortarclad.

## 2.04 INTERIOR PRIMERS/SEALERS

- A. Primer Sealer, Modified Polyamine Epoxy:
  - 1. Tnemec Company, Inc.; Series 201, Epoxoprime.

### 2.05 EPOXY COATINGS

- A. Polyamidomine Epoxy:
  - 1. Tnemec Company, Inc.; Series N69, Hi-Build Epoxoline II.
- B. Modified Polyamine Epoxy:
  - 1. Tnemec Company, Inc.; Series 237, Power Tread.
- C. Modified Polyamine Epoxy:
  - 1. Tnemec Company, Inc.; Series 280, Tneme-Glaze.
- D. Waterborne Epoxy-Amine Aduct:
  - 1. Tnemec Company, Inc.; Series 287, Enviro-Pox.
- E. Modified Polyamine Ceramic Epoxy:
  - 1. Tnemec Company, Inc.; Series 431, Perma-Shield PL
- F. Modified Aliphatic Amine Epoxy Mortar:
  - 1. Tnemec Company, Inc.; Series 434, Perma-Shield H2S.
- G. Modified Polyamine Epoxy:
  - 1. Tnemec Company, Inc.; Series 435, Perma-Glaze.

## 2.06 POLYURETHANE COATINGS

- A. Ceramic-Modified, Waterborne, Aliphatic Polyurethane:
  - 1. Tnemec Company, Inc.; Series 297, Enviro-Glaze.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

     a. Concrete: 12 percent.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

# 3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates 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.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  - 1. Clean surfaces with pressurized water. Use pressure range of 4000 to 5,000 psi at 6 to 12 inches.
  - 2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
- E. 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 7/NACE No. 4, "Brush-Off Blast Cleaning."
  - 2. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
  - 3. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
  - 5. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. 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 coatings.

- H. Aluminum Substrates: Remove loose surface oxidation.
- I. Piping: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  - 1. Abrasive blast clean for Ductile Iron Pipe External Pipe Surfaces as detailed in NAPF 500-03-04, "Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings."
  - 2. After abrasive blast clean, test pipe wall thickness with acoustic-based pipe condition assessment and deliver to Owner prior to coating application. Sufficient time shall be provided to Owner to review the condition assessment prior to scheduling coating application.

# 3.03 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  - 1. Use applicators and techniques suited for coating and substrate indicated.
  - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

# 3.04 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

# 3.05 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Concrete Substrates, Vertical Surfaces:
  - 1. Wastewater Channels & Wet Well (vertical and horizontal surfaces):
    - a. Repair Mortar: Tnemec Series 217 at 1/4 inch to 2 inches DFT.
    - b. Resurfacer: Tnemec Series 218 at 1/16 inch to 1/2 inch DFT.
    - c. Intermediate Coat: Tnemec Series 434 at 1/8 inch to 125 mils DFT.
    - d. Topcoat: Tnemec Series 435 at 15 to 20 mils DFT.
- B. Galvanized-Metal Substrates:
  - 1. Epoxy System:
    - a. Prime Coat: Tnemec Series N69 at 3.0 to 4.0 mils DFT.
    - b. Topcoat: Tnemec Series N69 at 3.0 to 4.0 mils DFT.
- C. Ductile Iron Pipe:
  - 1. Piping:
    - a. Interior Lining: Tnemec Series 431 Perma Shield at 40 mils DFT.
    - b. Exterior Coating: Tnemec Series 431 Perma Shield at 30 mils DFT.

# END OF SECTION

## SECTION 11282 CAST IRON GATES

## PART 1 GENERAL

### 1.01 SUMMARY

- A. This section covers all sluice gates required on this project. Each sluice gate shall be furnished and installed complete with operating stem, stem guides, brackets, operating floorstand, electrical actuator, and other appurtenances or accessories as specified. This section includes:
- B. Provide gates as shown on the plans.

### 1.02 REFERENCES

- A. ASTM: American Society of Testing and Materials
- B. AWWA: American Water Works Association

### 1.03 SYSTEM DESCRIPTION

- A. Design and Performance Requirements:
  - 1. All gates in accordance with the latest edition of AWWA C560 Standard for Cast Iron Slide Gates/Sluice Gate.
  - 2. Proportion for stresses occurring during continuous operation and for additional stresses occurring during fabrication or installation.
  - 3. Working stresses shall not exceed the lower value of: one-third of the yield strength or one fifth of the ultimate strength of the material.
  - 4. Seating head and unseating head as measured above the center line of the gate is as follows:
    - a. Gates 2, 3, & 4: Seating pressure equal to 28 feet. Unseated pressure equal to 28 feet.
    - b. Gates 7, 8, & 9: Seating pressure equal to 31 feet. Unseated pressure equal to 31 feet.
    - c. Gate 11: Seating pressure equal to 43 feet. Unseated pressure equal to 43 feet.
- B. Leakage Criteria and Requirements:
  - 1. Unseating Head: Leakage shall not exceed 0.2 gallon per minute per foot of periphery under design head condition. Leakage for seating head shall be tested in the factory and results provided to Engineer.
  - 2. Seating Head: Leakage shall not exceed 0.1 gallon per minute per foot of periphery under design head conditions. Once gates are installed, gates will be put into operation to evaluate leakage for unseating head. Contractor may not proceed with work on unseated side until leak test has been met.

### 1.04 SUBMITTALS

- A. General:
  - 1. Submit Product Data in sufficient detail to confirm compliance with requirements of this Section. Submit Product Data and Shop Drawings in one complete submittal package. Partial submittals are unacceptable.
  - 2. Submit in accordance with Section 01300.
- B. Product Data:
  - 1. Catalog cuts and product specifications for gates specified.
  - 2. Actuator data. Submit in accordance with Section 01300.
  - 3. Motor data. Submit in accordance with Section 01300.
  - 4. Coating systems. Submit in accordance with Section 01300.
- C. Shop Drawings:
  - 1. Installation and assembly drawings and specifically prepared technical data for gates.
  - 2. Wiring Diagrams: Show power and control connections and distinguish between factory installed and field installed wiring.
  - 3. Cast Iron Gate Schedule. Identify all gates by type number, pipeline, location, joint type, manufacturer, and model or catalog number.
- D. Test Results:
  - 1. Certified reports of manufacturers' factory production and final tests indicating compliance of gates with referenced standards.
  - 2. Certified reports of field tests and observations.
- E. Calculations
  - 1. Submit calculations to assure compliance with maximum loading of the screen room floor.
- F. Operation and Maintenance (O&M) Data:
  - 1. Operating instructions and maintenance data for materials and products for inclusion in O&M Manual.
  - 2. Manufacturer's written instructions for periodic tests of gates in service.
  - 3. Submit in accordance with Section 01300.

## 1.05 QUALITY ASSURANCE

- 1. Manufacturer Qualifications: Firms experienced in manufacturing equipment of types and capacities indicated that have record of successful in service performance.
- 2. Single Source Responsibility: Obtain gate components from single manufacturer with responsibility for entire system. Unit shall be representative product built from components that have proven compatibility and reliability and are coordinated to operate as unit as evidenced by records of prototype testing.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver gates and system components to their final locations in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is made safe from such hazards.
- B. Store equipment in clean, dry location.
- C. Manufacturer shall define the requirements to properly protect the equipment and parts shipped to the job site.

# 1.07 MAINTENANCE

- A. Provide spare parts necessary to maintain the equipment in service for a period of two years. At a minimum, one bronze operating nut of each size shall be provided.
- B. Provide special tools required for checking, testing, parts replacement, and maintenance.
- C. Spare parts shall be suitably packaged and labeled with the name and number of the equipment to which they belong.

# PART 2 PRODUCTS

# 2.01 MANUFACTURERS

- A. Rodney Hunt
- B. Waterman
- C. Hydrogate

## 2.02 SLUICE GATES

A. Materials: All materials used in construction of the gates and appurtenances shall conform to the following specifications:

Part	ASTM Designation
Ni-Resist Castings (Austenitic gray iron) for wall thimbles,	A-436 Type 1 or 2 *
frame, disc, guides, and stem guides	
Floorstands	A-276, Type 316
Bronze castings for wedges, thrust nut, lift nut, and coupling	B-584, C86500
Bronze for seat facings in frame and disc	B-21, C46400
Bronze tongue and guide liners	B98, C65500
Stainless steel for stems	A-276, Type 316
Stainless steel for fasteners, keys, etc.	A-276, Type 316

## B. Sluice Gate

- 1. Sluice gates shall be ni-resist cast austenitic gray iron, fully bronze mounted.
- 2. Gates shall have side wedges for seating head conditions and side, top, and bottom wedges for unseating head conditions when the width of the gate exceeds 24".
- 3. All gate components shall be designed to safely withstand the pressure head.

# C. Disc

- 1. Design disc to operate under maximum specified unbalanced head with minimum safety factor of five.
- 2. Construct discs of one piece with integrally cast vertical and horizontal ribs.
- 3. Provide reinforcing rib along each side.
- 4. Cast wedge pads for top and bottom wedges, and side wedges integrally on disc and machine to receive adjustable wedges on cast iron discs.
- 5. Cast tongues along each side of disc and machine for smooth operation in frame.
- D. Gate Mounting
  - 1. Contractor to inspect existing conditions, and verify mounting requirements with engineer prior to ordering gates.
  - 2. Concrete patching/repairs shall be performed as necessary.
  - 3. Provide thimble or frame mounting type as shown on drawings, or approved by engineer.
- 4. Frames shall be designed for maximum head indicated with a safety factor of five.
- 5. Frames shall be flat or flange type with round or rectangular opening as shown on drawings.
- 6. Machine contact surfaces of frame.
- 7. Provide corrosion resistant attaching fasteners.
- 8. For water stop, provide continuous collar located at center of wall.
- 9. Provide permanent gasket of uniform thickness between sluice gate and mounting.
- 10. Provide internal bracing to maintain alignment during concrete placement.
- E. Guides
  - 1. Cast iron, integral type or separate bolt on type attached to frame with corrosion resistant fasteners.
  - 2. Dowel bolt on type or precisely machined bolt holes for seating face alignment to prevent lateral movement with respect to frame.
  - 3. Machine contact surfaces.
  - 4. Overall clearances of disc tongue with gates shall be not more than 1/16-in.
  - 5. Provide machined pads on guides. Attach seat wedges.
  - 6. Guides shall be securely bolted to the frame.
  - 7. Guides shall be of sufficient length so that not less than 50% of the gate is in the guides when the gate is fully open.
- F. Wedges
  - 1. Provide with number of wedging devices to obtain specified leakage requirements.
  - 2. Provide adjustable and keyed wedges to prevent rotation during gate closure.
  - 3. Attach to disc to lock in position after adjustment.
  - 4. Provide gates with adjustable top and bottom wedging devices attached with two fasteners to frame or disc.
  - 5. Construct of solid cast bronze, machine contact surfaces.
- G. Seat Facings
  - 1. Bronze seat facings around perimeter of disc and frame.
  - 2. Bronze seat facings shall fill and permanently lock in machined dovetail grooves when pneumatically impacted into place without use of attaching pin and screws.

- 3. After mounting bronze seat facings to disc and frame, machine to plane with 63 micro inch finish or better.
- 4. When disc is in fully closed and wedged in position against frame, maximum clearance between seating faces shall not exceed 0.004 inch.
- 5. Where noted, provide gate with continuous seal around gate perimeter.
  - a. Continuous seal shall allow gate to be partially open without perimeter leakage where gate is in contact with frame.
  - b. Seal shall be replaceable.
  - c. Flush bottom closure same as specified herein.
- H. Stems And Stem Splices
  - 1. Design to transmit in compression at least 2 1/2 times rated output of lift with 40 pound effort on crank or handwheel.
  - 2. Constructed of stainless steel solid round bar.
  - 3. Threaded portion of stem shall have machine cut or rolled full depth Acme threads.
  - 4. Provide stem couplings with internal threads for transmitting full thrust of stem.
  - 5. Provide contact surfaces of threads, including lift nut, with minimum 16 micro inch finish or better.
- I. Stem Guides
  - 1. Maximum spacing shall not exceed 10 feet or L/R ratio of stem shall not exceed 200.
  - 2. Provide adjustable bronzed-bushed removable stem support collars.
  - 3. Guide bearings shall be of split type and adjustable in two directions.
  - 4. Stem guides shall be spaced per manufacturer's recommendations.
  - 5. Each guide bearing shall have a separate pressure grease fitting at the roof and be connected to the bearing.
- J. Stem Covers
  - 1. Transparent, lexan or butyrate plastic, vented pipe stem cover and cap to provide indication of gate position, permit inspection of stem threads, and protect stem from contamination.
  - 2. Provide stem covers with OPEN/CLOSE designators on clear mylar pressure sensitive adhesive tape, suitable for outdoor application.
- K. Flush Bottom Closure
  - 1. Provide gate with disc or frame mounted flush bottom seal as specified.
  - 2. Hold compressible resilient seal in place using corrosion resistant retainers and fasteners.

Top surface of seal shall be flush with gate invert.

- 3. Machine full length of bottom edge of disc for mounting of seal or for making uniform contact with seal when mounted on frame.
- 4. Differential pressure on seal shall be variable by adjustment of wedges on gate.
- 5. Shape seal to produce wide sealing area on machined cast iron stop bar, bolted and keyed to gate frame, and forming flush invert.
- L. Bolts and Nuts
  - 1. All steel bolts and nuts for assembling the gate guides, frame and stem guides, and anchor bolts for the hydraulic cylinder will have US standard threads and be assembled with not more than two threads extending beyond the nut. These bolts and nuts will be stainless steel.

# 2.03 ELECTRIC ACTUATOR (FURNISHED BY GATE MANUFACTURER)

- A. Manufacturers:
  - 1. Rotork
  - 2. EIM
  - 3. Kerry
  - 4. No like, equivalent, "or equal", or substitute item is permitted.
- B. General:
  - 1. In accordance with AWWA C542 Electric Motor Actuators for Valves and Slide Gates.
  - 2. Provide electric hoisting mechanism operation for gates as indicated.
  - 3. Provide Open/Close electric actuators as indicated.
- C. Design Requirements:
  - 1. Furnished and sized by gate manufacturer.
  - 2. Self-contained, packaged-unit.
  - 3. For non-self-contained units provide stainless steel or ductile iron pedestal to place input shaft approximately 36 inches above surface. Level pedestal with grout pad and fasten pedestal to surface.
  - 4. Electric motor double-reduction gear type consisting of motor controls, gearbox, geared limit switches, torque switches, and manual override with de-clutching level.
  - 5. Push button operation shall be provided at a local control panel with pilot lights and position indication.

- 6. Torque output no less than 1.5 times the required operating torque.
- 7. Self-locking.
- 8. Operate gate from full open to full closed, or the reverse, at a gate travel speed of 12 inches per minute.
- 9. Removable from gate without taking gate out of service.
- 10. Designed for mounting and running in any position.
- 11. Mechanical visual position indicator.
- 12. Ambient temperature rating: negative 40 degrees Fahrenheit to 150 degrees Fahrenheit.
- D. Construction:
  - 1. Gearbox totally enclosed and sealed.
  - 2. Gearbox shall have oil or grease lubricated gears and shafts of heat-treated alloy steel and bronze, supported throughout by anti-friction ball or roller bearings and permanently lubricated at the factory.
  - 3. Electrical components factory wired, except devices located remote from actuator.
  - 4. Integral terminal strips for field wiring connections.
  - 5. Separately sealed terminal compartment for remote control connections.
  - 6. Heater and thermostat for humid and low temperature environment.
  - 7. NEMA 4X enclosure for motor, gearing, switches, and wiring terminals, NEMA 7 where indicated explosion proof.
- E. Manual Operation:
  - 1. Engageable manual override.
  - 2. Manual operation possible by handwheel.
  - 3. Safety interlock feature to prevent motor operating when manual override engaged.
  - 4. Failure of the motorized gearing shall not prevent manual operation.
- F. Motor:
  - 1. Nameplate hp as required and defined by gate and actuator manufacturer shall not exceed maximum horsepower unless approved by Engineer.
  - 2. 480 volt, 3-phase, 60 hertz
  - 3. Constant speed

- 4. Reversible
- 5. Maximum speed: 1800 RPM.
- 6. Standard duty cycle for Open-Close electric actuators.

### G. Control:

- 1. Reversing motor controller (solid-state for continuous modulation).
- 2. Control power transformer.
- 3. Automatic reset thermal overload relay.
- 4. Current-sensing motor overload relay or automatic phase correction single phase protection.
- 5. OPEN/STOP/CLOSE local control pushbuttons.
- 6. Remote OPEN/STOP/CLOSE position control (non-continuous modulation).
- 7. Remote 4-20mAdc position control (continuous modulation).
- 8. Timer to Inhibit/Limit the Motion/Duty Cycle (continuous modulation).
- 9. Deadband adjustment of Process/Feedback signal deviation (continuous modulation).
- 10. OPEN/CLOSE position indicating lights or LEDs.
- 11. Pad-lockable STOP/LOCAL/REMOTE switch.
- 12. Automatic double acting geared limit switches.
- 13. Limit switches geared directly to the operating gear train, independently adjustable, and capable of being adjusted to trip at any point between full open and full closed.
- 14. Adjustable travel limit switches factory set to full open and full closed positions.
- 15. Automatic double-acting torque switches.
- 16. Torque switches or torque sensing operate during the complete gate cycle to protect the gate from excessive loads in either travel direction.
- 17. Unpowered contacts for indication of REMOTE, OPEN and CLOSED status, rated at 5 amps at 120 vac.

#### 2.04 GATE ACCESSORIES

- A. Floor Stands:
  - 1. Floor stand shall be suitable for the gate and able to handle the dead weight of electric actuator, and the maximum forces transmitted to the floor stand during operation of the gate as indicated by the calculations required in Part 1 of this specification section.
  - 2. Shall be properly anchored to the support surface.

#### 2.05 COATINGS

- A. Manufacturer is responsible for surface preparation, priming, and finish coating of equipment in plant or field.
- B. Prior to substantial completion, examine coated surfaces and retouch or refinish surfaces (with same coating material) to leave in condition acceptable to Engineer.
- C. Coatings shall comply with manufacturer's recommendations.
- D. Stainless steel surfaces shall not be coated. All weld burn and slag shall be mechanically passivated in accordance with ASTM A380 to provide a uniform finish.
- E. Coat machined or bearing surfaces and holes with protective grease.

#### PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install gates in accordance with manufacturer's written instructions.
- B. Installation of all parts shall be done by Contractor in a workmanlike manner and in accordance with detailed technical installation procedures supplied by gate manufacturer. It shall be Contractor's responsibility to handle, store, and install gate operating mechanism and accessories in strict accordance with manufacturer's drawings and recommendations.
- C. Equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions and recommendations of equipment manufacturer unless exceptions are noted by Engineer.
- D. Gates and operators shall be supplied with all necessary parts and accessories indicated on Drawings, specified or otherwise required for a complete, properly operating installation.
- E. Gates shall be shop inspected for operation before shipping.
- F. Install gates in accordance with manufacturer's written recommendations and approved submittals.
- G. Contractor shall provide new anchors and new embedments into the concrete. Existing anchors and embedments shall not be utilized.

H. Electric actuator orientation and positioning, or rotation of various component heads on actuator may be required to be adjusted in the field after, or during, installation. Contractor shall coordinate with Engineer in positioning actuator to allow best access to controls and allow handwheel to be in lowest position possible and accessible with portable actuator.

### 3.02 IDENTIFICATION

A. Provide equipment identification marker complete with equipment name and tag number in accordance with Owner direction. Coordinate field location with Engineer

# 3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services:
  - 1. Supplier's or manufacturer's representative for equipment specified herein shall be present at jobsite or classroom designated by Owner for man-days indicated, travel time excluded, for assistance during plant construction, plant startup, and training of Owner's personnel for plant operation. Include:
    - a. 3 man-days for Installation Services.
    - b. 1 man-day for Instructional Services.
    - c. 1 man-day for Post Startup Services

### 3.04 DEMONSTRATION

- A. After installation has been completed, test sluice gates under normal operating conditions in presence of Engineer.
- B. Repair leaks or other imperfections found upon testing.

# END OF SECTION

#### SECTION 11283 STAINLESS STEEL SLIDE PLATE

PART 1 GENERAL

#### 1.01 SUMMARY

A. The Contractor shall furnish all labor, materials, equipment and incidentals required to install, ready for operation and field test stainless steel stop gates and appurtenances as shown on the Contract Drawings and as specified herein.

#### 1.02 REFERENCES

A.	ASTM A240	Stainless and Heat Resisting Plate
B.	ASTM A276	Stainless and Heat Resisting Steel Bars and Shapes.
C.	ASTM D2000	Rubber Products in Automotive Applications
D.	ASTM D4020	Ultra-High Molecular Weight Polyethylene
E.	ASTM F593	Stainless Steel Bolts, Hex Cap Screws and Studs
F.	ASTM F594	Stainless Steel Nuts
G.	AWS D1.6	Structural Welding Code – Stainless Steel

### 1.03 SUBMITTALS

- A. Provide the following information to confirm compliance with the specification in addition to the submittal requirements specified in Section 01300.
- B. Complete description of all materials including the material thickness of all structural components of the frame and slide.
- C. General assembly drawings showing all details of construction, details required for installation, dimensions, and anchor bolt locations. General assembly drawings must be provided in 3D format.
- D. Maximum bending stress and deflection of the slide under the maximum design head.

#### 1.04 QUALITY ASSURANCE/QUALIFICATIONS

- A. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20 years experience designing and manufacturing water control gates. The manufacturer shall have manufactured water control gates for a minimum of 100 projects.
- B. The manufacturer's shop welds, welding procedures, and welders shall be qualified and certified in accordance with the requirement of the latest edition of ASME, Section IX or AWS D1.6 Structural Welding Stainless Steel.

### PART 2 EQUIPMENT

### 2.01 MANUFACTURERS

- A. Rodney Hunt
- B. Waterman
- C. Hydrogate
- D. Fontaine
- E. Mueller

### 2.02 GENERAL

- A. Each stop gate will be manufactured as detailed here and will be supplied fully tested as per requirements. To the maximum extent possible, the gate assembly comprising of frame and slide will be supplied as a factory assembled unit and shipped to site ready to install.
- B. The stop gates will be designed for water tightness for both seating and un-seating differential head per the actual site requirement as follows:
  - 1. Gates 1 & 5: Seating pressure equal to 28 feet. Unseated pressure equal to 28 feet.
  - 2. Gates 6 &10: Seating pressure equal to 31 feet. Unseated pressure equal to 31 feet.
- C. The stop gates will be shop tested to verify the leakage performance at operating head.
- D. The allowable leakage rate for the stainless steel stop gates in this specification shall be 0.1 gpm/ft of wetted seal perimeter in seating head and unseating head conditions.
- E. The gates shall utilize self-adjusting seals or lip seals.
- F. All structural components of the frame and slide shall be g a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
- G. All welds shall be performed by welders with AWS certification for the material grades used in fabrication.

### 2.03 CONTAMINATION PREVENTION

- A. In order to avoid contamination and maintain surface purity, the principle manufacturing facility must have a dedicated stainless steel facility segregated and isolated from the facility where products of other materials such as carbon steel or cast iron are manufactured. The stainless steel material must be kept separated from other materials beginning from acquisition and storage through handling, fabrication, assembly, and dispatch.
- B. Mechanical removal of free iron particle, oil, dirt, paint, welding flux, slag, heat tint and scales of oxides must be supplemented with chemical passivation

### 2.04 CORROSION PREVENTION

- A. To prevent crevice corrosion and advocate long life of stainless steel fabricated products, the principle manufacturer must only use continuous welding practices performed in house by the principle manufacturer.
- B. Cutting of stainless steel shall be either by cold saw, water jet or laser. Plasma arc is not allowed unless 1/8" of material is removed from the edge by post processing

### 2.05 FRAME

- A. The frame assembly, including the guide members and invert member, shall be constructed of shapes with a minimum thickness of 1/4-inch.
- B. Frame design shall allow for mounting to the existing facility without modification. If additional modifications are required based on the manufacturer's design, Contractor shall account for any modifications in their bid.
- C. Gussets shall be provided as necessary to support the guide members for wall mounted gates in an unseating head condition.
- D. The frame shall extend from the invert to the floor or shall terminate below floor grating.
- E. A rigid invert member shall be provided across the bottom of the opening. The invert member shall provide for a flush bottom seal.

### 2.06 SLIDE

- A. The slide and reinforcing stiffeners shall be constructed of stainless steel plate and shapes. All structural components shall have a minimum thickness of 3/16 inch.
- B. The slide shall not deflect more than 1/360 of the span or 1/16 inch, whichever is smaller, under the maximum design head.
- C. Reinforcing stiffeners shall be continuously welded to the slide and mounted horizontally. Vertical stiffeners shall be continuously welded on the outside of the horizontal stiffeners for additional reinforcement.
- D. Slides equal to or greater than 30" in height shall have vertical stiffeners in addition to horizontal stiffeners.
- E. Slides shall be provided with a means to lift the gate by hand. For gates less than or equal to 24" in width a single lift point shall be provided. For gates wider than 24" two lift points shall be provided. The lift point shall be a hole in the slide with a 1" diameter or larger pipe used to protect against sharp edges. Alternately, a U-shaped bar with a minimum 3/4" nominal diameter shall be welded to the slide. For slides whose top is more than 12" below the floor, extended U-shaped bars shall be used, extending to below the floor or grating.
- F. The corners of the slides shall have a radius of not less than 1/2".
- G. Slides shall be permanently marked with the slide weight, nominal width and height.

#### 2.07 SEALS

- A. All gates shall be provided with seals to restrict leakage in accordance with the requirements listed in this specification.
- B. All gates shall be equipped with UHMW polyethylene guide inserts to prevent stainless steel sliding on stainless steel.
- C. Lip seals shall provide positive sealing in both directions. A resilient invert seal shall be provided.
- D. Gates that utilize rubber "J" seals or "P" seals are not acceptable.
- E. The seal system shall result in an operating effort of no more than two pounds per inch of gate height when removed or inserted under balanced head.

### 2.08 MECHANICAL OPERATOR MECHANISMS

A. For gates with a total lifting (removal) force, slide weight plus seal resistance, greater than 150 pounds, the slide shall incorporate features allowing for lifting with a davit crane or similar device. The point of attachment shall not be the hand holes or lift bar.

### 2.09 ANCHOR BOLTS

- A. Anchor bolts shall be provided by the gate manufacturer for mounting the gate frames when not embedded.
- B. Quantity and location shall be determined by the gate manufacturer.
- C. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
- D. Anchor bolts shall have a minimum diameter of 1/2-inch.

# 2.10 MATERIAL OF CONSTRUCTION

- A. Frame Assembly
  - 1. Stainless Steel, ASTM A240 Type 304L, or
  - 2. Stainless Steel, ASTM A240 Type 316L.
- B. Slide and Stiffeners
  - 1. Stainless Steel, ASTM A240 Type 304L, or
  - 2. Stainless Steel, ASTM A240 Type 316L.

### C. Fasteners

- 1. ASTM F593 and F594 GR1 for type 304.
- 2. ASTM F593 and F594 GR2 for type 316.
- D. Anchor Bolts
  - 1. Stainless Steel, ASTM A276 Type 304, or
  - 2. Stainless Steel, ASTM A276 Type 316.
- E. Invert Seal
  - 1. Neoprene, or
  - 2. EPDM ASTM D-2000.
- F. Guide Inserts
  - 1. Ultra-High Molecular Weight Polyethylene ASTM D4020.
- G. Lip Seals
  - 1. Neoprene, or
  - 2. EPDM ASTM D-2000, or
  - 3. Ultra-High Molecular Weight Polyethylene ASTM D4020.

### PART 3 EXECUTION

- 3.01 INSTALLATION
  - A. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the CONTRACTOR to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
  - B. The CONTRACTOR shall review the installation drawings and installation instruction prior to installing the gates.
  - C. The gate assemblies shall be installed in a true vertical plane, square and plumb.
  - D. The CONTRACTOR shall fill the void in between the gate frame and the wall with nonshrink grout as shown on the installation drawing and in accordance with the manufacturer's recommendations.
  - E. The CONTRACTOR shall add a mastic gasket between the gate frame and wall thimble (when applicable) in accordance with the manufacturer's recommendations.

### 3.02 FIELD TESTING

- A. After installation, all gates shall be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section.
- B. Each gate shall be inserted into and removed from the frame to confirm operation without binding, scraping, or distorting.
- C. Each gate shall be water tested by the CONTRACTOR, at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed the specified allowable leakage.

# END OF SECTION

### SECTION 11330 MECHANICAL BAR SCREENS

### PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Contractor shall furnish and install two (2) mechanically cleaned bar screens with multiple rake blades as indicated on the drawings and as specified herein.
- B. The units shall be furnished and installed with all necessary accessory equipment and auxiliaries, whether specifically mentioned in this section or not, as required for an installation incorporating the highest standards for the type of service including field testing and instructing the regular operating personnel in the care, operation and maintenance of all equipment.
- C. Each screen shall be furnished complete with bar rack, dead plate, discharge chute, side frames, covers, rake blades, drive chains, sprockets and bearings, scraper assembly, drive motor, gear reducer, anchor bolts, controls and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation.
- D. The bar screen shall remove debris (screenings) from the incoming wastewater by means of a front cleaned bar rack to be installed in a concrete channel. The screen shall retain debris at the bar rack. Rake blades shall remove and lift the debris to a discharge mechanism. The bar rack shall be cleaned by a series of rakes engaging the bar rack from the upstream side (front) at the bottom of the channel and then moving up along the bar rack. The debris shall be lifted above the channel and dropped on a discharge chute at the downstream side (back) of the screen. Screens with single rakes shall not be approved.
- E. The control panel shall be provided with a PLC and Operator Interface Terminal (OIT). The PLC shall monitor and control all of the equipment supplied by the screen supplier.

### 1.02 SUBMITTALS

- A. Submit, in accordance with Section 01300, copies of all materials required to establish compliance with this Section. Submittals shall include the following:
  - 1. Certified shop and erection drawings showing details, sizes, grades, protective coatings and materials of construction; dimensions; and any anchor bolt locations.
  - 2. Hydraulic calculations and flow curves for the proposed screen verifying that the screen is capable of processing the peak flow.
  - 3. Descriptive literature, bulletins, catalogs and local supplier of the equipment.
  - 4. The total weight of the equipment including the weight of the single largest item or component, both when empty and when loaded with the maximum load of wet debris.
  - 5. Complete bill of materials for all equipment components.

- 6. List of the manufacturer's recommended spare parts.
- 7. Complete motor, drive and performance factor data.
- 8. Details of the control panel, relays, and wiring including the wiring diagram.
- 9. Startup and testing procedures.
- 10. Installation drawings including written procedure for installation of all equipment within the existing building and any removal and replacement details of the composite roof panels that may be necessary for proper installation.
- B. Submit operations and maintenance data in accordance with Section 01730 Operation and Maintenance Data.
- C. Submit closeout submittals in accordance with Section 01700 Execution and Closeout Requirements. Certify that equipment has been installed according to manufacturer instructions.
- D. Record actual locations of installed equipment and components in accordance with Section 01720 Project Record Documents.

### 1.03 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. American Welding Society (AWS)
- D. American Institute of Steel Construction (AISC)
- E. American Bearing Manufacturers Association (ABMA)
- F. American Gear Manufacturers Association (AGMA)
- G. National Electrical Manufacturers Association (NEMA)
- H. Underwriters Laboratory (UL)
- I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.04 DELIVERY STORAGE AND HANDLING

- A. Section 01600 Control of Materials: Requirements for transporting, handling, storing, and protecting products.
- B. Ship in as few parts as possible, requiring minimum onsite assembly.
- C. Provide lifting eyes or lugs to allow easy installation of the unit into the waiting floor openings and wall recesses.

- D. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.
- E. All equipment and parts must be properly protected against any damage during a prolonged period at the site.
- F. Each box or package shall be properly marked to show its net and total weight in addition to its contents.

### 1.05 QUALITY ASSURANCE

- A. The equipment specified herein shall be the product of a reputable and qualified manufacturer who is of proven ability and has at least five years of experience in the production of such equipment in sizes similar to those required on this project. The manufacturer shall have completed and made ready for operation at least twenty-five separate installations in the United States that have been in operation for at least five years.
- B. The mechanical screen shall be suitable for satisfactory operation within the maximum and minimum water levels in the channel in which it is to be installed as indicated within.
- C. Manufacturer's Services: Provide equipment manufacturer's services at the jobsite for the minimum labor days (8 hours) listed below, travel time excluded:
  - 1. Two labor-days to check the installation and advise during start-up, testing, and adjustment of the equipment.
  - 2. Two labor day to instruct the Owner's personnel in the operation and maintenance of the equipment.

### 1.06 ENGINEER'S APPROVAL OF ALTERNATE EQUIPMENT

- A. The screen design was based on the FlexRake Front Clean Front Return mechanical bar screen by Duperon. Should equipment which differs from this Section be offered and determined to be equal to that specified, such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of affected areas, including materials and labor for structures, piping, appurtenant equipment, electric, etc, required to accommodate such a substitution be made at no additional cost to the Owner and be as approved by the Engineer.
- B. Manufacturer of alternate equipment shall submit a pre-approval package to Engineer at least two (2) weeks prior to bid date. Alternate manufacturer shall submit the following information and supporting documentation:
  - 1. Standard equipment drawings showing the equipment meeting the specifications in this section. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
  - 2. Detailed installation drawings illustrating how the proposed screen fits in the channel. The drawings shall include plan, elevation, and sectional views of the installation.

Drawings shall include details of the discharge chute, details of the seal between screen and side walls of the channel, and details of anchor bolt locations.

- 3. Hydraulic calculations and flow curves for the proposed screen verifying that the screen is capable of processing the peak flow.
- 4. Motor characteristics and performance information.
- 5. Reference list of all installations of same and similar equipment.
- 6. Complete bill of materials for all equipment.
- 7. Documentation of required maintenance for all equipment including an approved list of lubricants and the required quantities.

### 1.07 WARRANTY

- A. The equipment manufacturer shall provide a three (3) year warranty for all items furnished in accordance with Section 01740. The warranty shall run concurrently with the Contractor's warranty and commence at final completion and acceptance by the Owner.
- B. The warranty shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer.

### PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. FlexRake ® from Duperon
- B. Traveling Multi-Rake Screen from pre-approved alternate manufacturer(s). Alternates shall not be acceptable unless pre-approved. Costs for changes in design to accommodate alternative offers shall be borne by the alternate screen provider.

#### 2.02 BAR SCREEN DESIGN SPECIFICATIONS

### A. DESCRIPTION

- 1. The equipment specified herein is intended to be standard equipment for use in a screenings removal system, specifically to separate larger, solid and semi-solid debris and floating matter from raw wastewater.
- 2. Each Mechanical Bar Screen shall be furnished and installed in conformance with the drawings and the following data:

a.	Number of units	
b.	Equipment tag numbers	SCR-003-A, SCR-004-A
c.	Average flow per screen, MGD	
d.	Maximum flow per screen, MGD	
e.	Minimum water depth, ft	

f.	Clear screenings discharge height above operating floor, ft-in	4 ft-6 in
g.	Clear spacing between screen bars	
ĥ.	Maximum differential head across screen, ft	6 ft-0 in
i.	Maximum motor size, Hp	1 Hp
j.	Maximum rake velocity, fpm	

- 3. Approach velocity at average flow (1 screen operating) should be 2.00 fps. Approach velocity at peak flow (2 screens operating) should be 2.0 fps.
- 4. Headloss at average flow shall be less than 1.00 ft and headloss at peak flow shall be less than 1.00 ft, assuming 25% blinding.
- 5. For sites that have (3) ft or greater head differential, equipment manufacturer shall provide Structural Certification from licensed Civil engineer.

### B. MATERIALS

- 1. Unless noted otherwise materials of construction shall be 304 Stainless Steel. A stainless steel channel bottom plate shall be an integral part of the bar screen assembly to fully engage scrapers in the bar screen at the base of the unit and assure that the raking mechanism reaches the bottom of the screen to prevent debris accumulation. The bar screen assembly shall be shipped in one piece.
- 2. Each major piece of equipment shall be furnished with a stainless steel nameplate (with embossed data) securely mounted to the body of the equipment. The nameplates for the pumps shall include the manufacturer's name and model number, serial number, rated flow capacity, head, speed and all other pertinent data. The nameplates for motors shall include the manufacturer's name and model number, serial number, speed, input voltage, amps, number of cycles and power and service factor.

# C. BAR SCREEN DESIGN

- 1. The bars shall consist of minimum dimensions of 0.25 inch x 0.75 inch x 0.13 inch Type 316 stainless steel bars fastened at the top, bottom, and at intervals as required to withstand the maximum differential head across the screen and to maintain the required clear spacing (0.75 inch) between the bars. The bars shall be straight and inclined upstream 20 degrees from vertical, and shall span the full width of the channel. Bars shall be individually replaceable without welding.
- 2. The bar rack shall extend vertically to the top of the channel. The bar rack shall be firmly anchored to the channel floor and to a deadplate at the top. Additional supports and anchorage to the walls shall also be utilized so that the bar rack can withstand the maximum differential head.
- 3. The bar screen shall be provided with a dead plate extending from the bar rack to the discharge chute. A deadplate constructed of 1/4-in Type 316 stainless steel plate shall extend from the bar rack to the to the point of discharge. The dead plate shall be securely fastened to the side frames.
- 4. The discharge chute shall be mounted to direct screenings into the conveyor. The chute shall have a slope of minimum 60 degrees. The discharge chute shall be made of a

minimum 0.12 in (3 mm) thick stainless steel plate.

- 5. A 316 stainless steel and UHMW-PE debris blade assembly, which does not require a separate drive, shall be installed to assist in removing debris from the scraper on the mechanically cleaned bar screen unit as recommended by the manufacturer. Hydraulic, shock, or spring controlled debris blade mechanisms are not acceptable.
- 6. A frame shall be provided supporting all required loads. Side Fabrication: The screen framework shall be 316 stainless steel bent plate with minimum of 3/16 inch cross section. Horizontal members shall be of stainless steel bent plate or stainless steel pipe. Support members and frame shall adequately support the bar screen based on site specific requirements. The support frames shall be securely anchored onto the operating floor.
- 7. All anchor bolts required for the installation of the equipment shall be furnished by the equipment manufacturer. Anchor bolts shall be Type 316 stainless steel.
- 8. Bar screen enclosures or covers shall be provided by the screen manufacturer for each bar screen unit at each floor level to protect personnel from injury due to the normal and abnormal operation of the bar screen, and to protect the floor opening through which the bar screen operates. It shall surround the upstream end and both sides of the screen floor opening. The covers shall be easily removable, sufficiently stiffened stainless steel plates. The covers shall be provided with turn locks and handles.
- 9. Return guide/Closeouts shall be 316 stainless steel and shall assure proper alignment of scrapers as they enter the bar screen and assure that there is no space wider than the clear opening between bars to prevent passage of larger solids than allowed through the screen.
- 10. The link system shall be passivated stainless steel castings and have a minimum ultimate strength of 60,000 lbs with a minimum cross section of 1.5 inches and weighing a minimum of 4.5 lbs each. Parts must meet ASTM A380 specification for surface finish. Provide 316 stainless steel system to include 316 stainless steel retaining rings and 16 stainless steel pins.
- 11. The debris shall be removed from the bar rack by a Type 316 stainless steel rake assembly designed to mesh with the bar rack. The rake assembly shall consist of a shelf and rake tines.
  - a. Thru Bar Scrapers: Thru Bar Scrapers shall be minimum .375 inch thick x 5 inches x screen width 316 stainless steel.
- 12. The rake assembly shall be driven by an electric motor. The motor shall be UL rated for operation in Class 1 Division 1 environment. The motor shall be inverter duty rated, maximum 1.0 hp, 460 Volts, 60 Hz, 3-phase. The motor shall be rated for operation in a 104 degree F (40 degree C) environment. Motor shall be premium efficiency.
- D. The drive unit shall be designed for continuous service.
- E. Bar Screen Dead Plate Heat Pads to be provided. Power requirements for the Dead Plate heaters are 120VAC and provided by others. Installation of the field wiring supplied by others. Pads shall be fiberglass reinforced silicone rubber suitable for use on metal surfaces. Pads shall have a minimum power density of 2.5 W/in2 and a dielectric strength greater than 2000 volts. Pads shall have a high-limit thermostat designed to keep the pad below NEC

article 500 T-rating. Pads shall be moisture, chemical and radiation resistant. Class I Division II area head pads and thermostats

### 2.03 OPERATION

- A. The mechanically cleaned bar screen will either be started and stopped by the PLC in the control panel or will be started and stopped remotely by the Pump Station's SCADA system via the screen PLC. The Pump Station's SCADA system will either control the screens by time or by level. Level transmitters, furnished under Division 13, will provide level measurement upstream of the bar screen to the PLC. High level will override the internal software timer and continue to operate the screen until the level has dropped to a specified minimum value.
- B. Each raking assembly shall have a separate level system that shall be installed and field wired by others per the manufacturer's instructions.
- C. Two Level/Two Speed Control: When the lower level switch trips, the rake runs. When the upper level switch trips the rake runs at high speed. When the level switch returns to the normal position, an off-delay timer is initiated to prevent intermittent equipment starting/stopping. Cycle timing logic shall also be included that shall function in parallel with the level control for optimal rake run time.
  - 1. (2) Mechanical Float Switches including 50 ft long cabling.
  - 2. Provide two (2) Siemens HydroRanger 200 with (2) Ultrasonic Level Transducers. One transducer shall be installed upstream of each bar screen, at least 1 foot above the highest anticipated water elevation and the beam angle shall not have obstructions between the transducer face and the water surface. The HydroRanger will be configured with two level setpoints. A mechanical float switch can be used in conjunction with the HydroRanger as backup control.

### 2.04 LOCAL CONTROL PUSH BUTTON STATION

- A. Provide two (2) Local Control Stations with the functionality shown on the "I" drawings, complete with E-stop buttons. Provide a separate local control station for each bar screen.
- B. Enclosure shall be NEMA 7/9 rated for Classified area installation. Local push button station must be local to the equipment to maintain requirements of local safety codes as determined by the Engineer.
- C. Local station shall be mounted within 10 feet or as close to the equipment as safely possible and be field wired by the electrical subcontractor to the corresponding terminal inputs in the main control panel.
- D. The remote pushbutton station shall include Forward, Jog Reverse and E-Stop buttons.

#### 2.05 MAIN CONTROL PANEL

- A. Power shall be 480V/3ph/60hz
- B. Provide one NEMA 4X control panel for two bar screens.
- C. Control panel shall include AC, thermostat, and heater inside the panel.
- D. The Main Control Panel shall include at a minimum the following
  - 1. Main fusible disconnect with lockable operator, unless otherwise specified.
  - 2. Physical or virtual Hand/Off/Auto (HOA) Selector and Push/pull E-Stop button.
  - 3. Elapsed run-time meter.
  - 4. Indication for "Power On", "Forward" and necessary faults.
  - 5. Relay Based Controls shall include the following:
    - a. Variable Frequency Drive (VFD)
    - b. Electronic torque control
    - c. Hard contact SCADA Interlock(s)
    - d. Adjustable on/off cycle timers
  - 6. PLC Based Controls shall include the following:
    - a. Programmable Logic Controller (PLC)
    - b. Variable Frequency Drive (VFD)
    - c. HMI programmable functions as required
    - d. SCADA Interlocking via Hard Contact and/or Ethernet Communications Protocols as required.
- E. Programmable Logic Controllers (PLCs)
  - 1. The Main Control Panel shall be provided with a PLC for local monitoring and control. The PLC shall be an Allen-Bradley CompactLogix with Ethernet communication capabilities to be compatible with the Owner's existing, installed PLCs. It shall be programmed with RSLogix 5000.
  - 2. The Main Control Panel shall be provided with an OIT for local monitoring and control. The OIT shall be an Allen-Bradley PanelView Plus 7 6600 with Ethernet communication capabilities to be compatible with the Owner's existing, installed OITs.
- F. Automatic operation shall include the following and as shown on the P&ID's. In general, it shall be as follows:
  - 1. All devices can be run locally.
  - 2. All devices shall be able to be run in Remote Manual.
  - 3. The bar screen shall run in one of two Remote Automatic modes. It shall be started and run when the level upstream of the bar screen exceeds a set point value or it shall be started when the elapsed time since last run exceeds a time limit.

#### 2.06 FACTORY TESTING

A. Prior to shipment, each bar screen shall be fully assembled and operated at the factory at its required operating angle of inclination prior to shipment. Match mark mating parts prior to disassembly for shipping.

### 2.07 MAINTENANCE

- A. Furnish all special tools required for normal operation and maintenance of the equipment.
- B. Provide two (2) sets of the manufacturer's recommended spare parts for the equipment.
- C. Pack all spare parts for long-term storage in an unheated, unventilated, damp area in containers which are clearly identified on all sides with indelible markings as to contents.
- D. Manufacturer shall provide specialty tools and recommend spare parts required for maintaining the Bar Screens as follows:
  - 1. Drive Clevis Pin (1)
  - 2. Snap/Retaining Rings (10)
  - 3. Link Clevis Pins (4)
  - 4. Scraper Bolts (4)
  - 5. Scraper Nuts (4)
  - 6. Snap Ring Tool (1)
  - 7. Never Seez, 1 oz. tube (1)
- E. Manufacturer shall provide one tube of Multi-Purpose grease which is a 5-year supply of lubrication, required for maintaining all bar screen components.

# PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals and/or any pre-installation checklists. Installation shall utilize standard torque values and be installed secure in position and neat in appearance. Installation shall include any site preparation tasks as required by the engineer or manufacturer; such as unloading, touch-up painting, etc. and any other installation tasks and materials such as wiring, conduit, controls stands as determined by the customer and/or specified by the manufacturer.
- B. Anchor bolts and nuts shall be 316 stainless steel and furnished for each item of equipment by the Contractor.

C. Anchor bolt template drawings shall be included in the submittal to permit verification of the location structural elements, new or existing in the concrete.

### 3.02 INSPECTION AND TESTING

- A. After completion of installation, Contractor shall provide for testing and shall be performed in strict conformance with the manufacturer's start up instructions. Testing of the bar screen shall demonstrate that the equipment is fully operational by picking up and depositing materials into specified containment.
- B. Field certification shall include inspection of the following:
  - 1. Verify equipment is properly aligned and anchored per the installation instruction and drawings. Assure the bar screen unit is square, flat and unobstructed with required clearances maintained.
  - 2. Assure controls and instrumentation work in all modes.
  - 3. Check equipment for proper operation of debris blade, scrapers, etc as well as completion of the Start-Up requirements in the installation guide.
- C. Provide Manufacturer's Installation Certification

### 3.03 DEMONSTRATION

- A. Section 01700 Execution and Closeout Requirements: Demonstration and training.
- B. Demonstrate equipment operation, routine maintenance, and emergency repair procedures to Owner's personnel.

# END OF SECTION

### SECTION 11340 CONVEYOR

### PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. The contractor shall furnish all equipment and labor required for a complete belt conveyor system as shown and specified.
- B. The units shall be furnished and installed with all necessary accessory equipment and auxiliaries, whether specifically mentioned in this section or not, as required for an installation incorporating the highest standards for the type of service including field testing and instructing the regular operating personnel in the care, operation and maintenance of all equipment.
- C. The conveyor shall be furnished complete with belt and chain, tracks and supports, drive unit, chain tensioning station, skirt boards, drip pans, safety stop switch, zero motion speed switch, solenoid chain oiler, belt scraper, hardware, accessories, and appurtenances specified or otherwise required for a complete and properly operating installation.
- D. The conveyor shall be sized to collect intermittent loadings of wastewater screenings with a maximum sphere size of 11-inch diameter, from two course screens, and convey, dewater and compact them without spillage, jamming or clogging to a discharge point as shown on the Drawings.
  - 1. Conveyor shall have 20 inch wide belt pans and shall travel at 35 FPM. Loading onto the conveyor shall be distributed evenly and shall be capable of a capacity of at least 8 wet tons per hour.
  - 2. The conveyor shall have a watertight modular conveying surface with a 20 degree troughed cross section at the outside of the belt width. Each modular conveying section shall have a convolution that permits the assembled belt to make continuous vertical, horizontal and helical turns that will flatten out as it goes over the drive station, and allows for continuous belt cleaning with a pre-tensioned scraper bar. The modular belt pan section shall be reinforced with non-metallic stiffeners molded into each modular belt section to achieve troughing. The conveyor will be designed in such a way that all moving parts of the system, except for the drive and tension station components will pass a single designated point along the conveying path which may be used for maintenance and/or service.
  - 3. System shall be capable of continuous operation, 24 hours per day, 7 days per week.

### 1.02 SUBMITTALS

- A. Submit, in accordance with Section 01300, copies of all materials required to establish compliance with this Section. Submittals shall include the following:
  - 1. Product Data.
  - 2. Certified shop and erection drawings showing details, sizes, grades, protective coatings and materials of construction; dimensions; and any anchor bolt locations.

- 3. Descriptive literature, bulletins, catalogs and local supplier of the equipment.
- 4. List of the manufacturer's recommended spare parts.
- 5. Startup and testing procedures.
- B. Submit operations and maintenance data in accordance with Section 01730 Operation and Maintenance Data.
- C. Submit closeout submittals in accordance with Section 01700 Execution and Closeout Requirements. Certify that equipment has been installed according to manufacturer instructions.
- D. Record actual locations of installed equipment and components in accordance with Section 01720 Project Record Documents.

### 1.03 QUALITY ASSURANCE

- A. The equipment specified herein shall be the product of a reputable and qualified manufacturer who is of proven ability and has at least five years of experience in the production of such equipment in sizes similar to those required on this project. The manufacturer shall have completed and made ready for operation at least twenty-five separate installations in the United States that have been in operation for at least five years.
- B. The conveyor shall be suitable for wastewater screenings.
- C. Manufacturer's Services: Provide equipment manufacturer's services at the jobsite for the minimum labor days (8 hours) listed below, travel time excluded:
  - 1. One labor-days to check the installation and advise during start-up, testing, and adjustment of the equipment.
  - 2. One labor day to instruct the Owner in the operation and maintenance of the equipment.

### 1.04 ENGINEER'S APPROVAL OF ALTERNATE EQUIPMENT

- A. The screen design was based on the Serpentix Conveyor Corporation Pathwinder P2 Conveyor. Should equipment which differs from this Section be offered and determined to be equal to that specified, such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of affected areas, including materials and labor for structures, piping, appurtenant equipment, electric, etc, required to accommodate such a substitution be made at no additional cost to the Owner and be as approved by the Engineer.
- B. Manufacturer of alternate equipment shall submit a pre-approval package to Engineer at least two (2) weeks prior to bid date. Alternate manufacturer shall submit the following information and supporting documentation:
  - 1. Standard equipment drawings showing the equipment meeting the specifications in this section. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.

- 2. Detailed installation drawings illustrating how the proposed screen fits in the channel. The drawings shall include plan, elevation, and sectional views of the installation. Drawings shall include details of the discharge chute, details of the seal between screen and side walls of the channel, and details of anchor bolt locations.
- 3. Hydraulic calculations and flow curves for the proposed screen verifying that the screen is capable of processing the peak flow.
- 4. Motor characteristics and performance information.
- 5. Reference list of all installations of same and similar equipment.
- 6. Complete bill of materials for all equipment.
- 7. Documentation of required maintenance for all equipment including an approved list of lubricants and the required quantities.

# 1.05 WARRANTY

- A. The equipment manufacturer shall provide a three (3) year warranty for all items furnished in accordance with Section 01740. The warranty shall run concurrently with the Contractor's warranty and commence at final completion and acceptance by the Owner.
- B. The warranty shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer.

# PART 2 PRODUCTS

# 2.01 MANUFACTURERS

- A. Pathwinder P2 from Serpentix Conveyor Corporation
- B. Conveyor from pre-approved alternate manufacturer(s). Alternates shall not be acceptable unless pre-approved. Costs for changes in design to accommodate alternative offers shall be borne by the alternate screen provider.

# 2.02 CONVEYOR DESIGN SPECIFICATIONS

# A. CONVEYOR BELT AND CHAIN

The conveying surface will consist of individually replaceable modular belt pan sections molded of moldable plastic rubber (MPR). The belt pans shall be fastened every eight (8) inches and supported by a nylon attachment and two (2) durable enhanced, plastic guide (and wear) blocks bolted to a case hardened alloy steel chain. The chain shall have a minimum breaking strength of 35,000 pounds. Each modular belt pan section will have a cleat-like convolution at least 1 1/2 inches high, permanently molded into the rubber. The closed-link alloy steel chain, with alternating horizontal and vertical links will allow for movement in two or more directions. The 4" pitch chain will be guided by the guide blocks bolted bilaterally to each vertical chain link. The belt pan attachments and guide blocks shall be shipped assembled

on the chain. The chain and guide blocks will operate in a UHMWPE track consisting of a base, two sides and two top containment angles.

### B. TRACKS AND SUPPORTS

The fabricated I-beam shall be the structural frame of the conveyor system. The top and bottom flanges of the I-beam will have the UHMWPE track, with bilaterally positioned angles to contain the guide blocks as they are pulled through the track system by the steel chain. The structural I-beam will be fabricated from 1/8-inch thick, 304 stainless steel. The containment angles will be UHMWPE. The guide blocks will stabilize the belt pan surface in the event of unbalanced material loading. Track sections of required length shall be factory fabricated and ready for job-site assembly by splice bolting where indicated. The conveyor supports shall be structural steel conforming to ASTM A572 Grade-50. All shop welding shall conform to the latest standards of the American Welding Society.

### C. DRIVE UNIT

The fully assembled drive station shall consist of two (2) horsepower, 230 / 460 VAC, 3Ph, 60Hz, XPFC (Class I – Division I) energy efficient motor. With a durable corrosion resistant UHMW polyethylene sprocket, gear reducer, V-belt, sheaves, and steel sprockets which in combination give the proper belt speed for the load indicated. A single chain drive between the reducer and the steel sprocket shaft is to be provided for further power and speed reduction. The belt drive sheaves shall be interchangeable in order to provide a different speed by means of other size sheaves. Directly coupled drive motor-gear reducer combinations shall not be acceptable. A mechanical ratcheting clutch shall be incorporated into the drive design to prevent or mitigate damage to any of the drive components/drive structure. Any type of overtorque condition created by product overloading or jamming conditions will cause the ratcheting clutch to release, isolating the power from the electric motor to the gearbox and other power transmission components. The torque setting is adjustable and shall be properly set at the factory for each conveyor application.

### D. CHAIN TENSIONING STATION

The fully assembled tension station shall consist of a durable corrosion resistant UHMW polyethylene chain sprocket, a constant pressure spring-loaded chain tensioner adjustable by a single ratchet, and track all fabricated and assembled in a structural frame ready for installation.

### E. SKIRT BOARDS

Conveyor skirt boards shall be provided along both sides of the full length of the conveyor. Skirts shall be 3/8" thick HDPE and shall be supported by brackets from the conveyor frame. Brackets shall be 304 stainless steel.

# F. DRIP PANS

16 gauge, galvanized sheet steel open-end style drip pans, with 304 stainless steel hanger brackets, shall be provided below the conveyor and shall be sloped as indicated on the drawings.

### G. SAFETY STOP SWITCH

Flag arm safety pull-cord switches on each side of the conveyor with orange protective coated cable running the entire length of the conveyor. NEMA 7 (Explosion Proof), 20 amps, 125, 250 or 480 VAC, single pole, double throw circuit.

### H. ZERO MOTION SPEED SWITCH

Located on the tension station, the zero speed switch is to be hardwired to the conveyor control circuit. NEMA 7 (Explosion Proof), 120 VAC, 5amps, isolated contact, 10-second start delay. It should be an Electro Sensors SCP 1000 pre-settable speed switch in an explosion proof housing with a PVC split collar magnet pulsar wrap, or equal.

### I. SOLENOID CHAIN OILER - EXPLOSION PROOF

Located at the tension station, a 120VAC solenoid oiler will lubricate the conveyor chain when the conveyor operates. The solenoid will be hardware wire to the control panel and energized when the conveyor motor is operating.

### J. BELT SCRAPER

A pre-tensioned scraping mechanism, with a replaceable rubber blade and UHMWPE backing plate to continuously remove most material from the conveying surface shall be provided at the conveyor discharge.

### K. HARDWARE

All nuts, bolts and washers shall be type 304 stainless steel.

### L. FACTORY FINISH

All stainless steel fabricated component shall retain their mill finish. All OEM supplied equipment will be furnished with their factory-applied finish.

### M. CONTROL SYSTEM

Manufacturer shall provide a complete and fully functional system, including all design criteria specified herein as well as all interfaces and controls as specified in other sections.

### 2.03 OPERATION

### A. Hand-Off-Auto Operation:

- 1. System shall be designed to run conveyor, regardless of interlock conditions, in Hand.
- 2. In Auto, system run command shall activate a timer which shall allow conveyors to run for a preset duration after system run command has cleared, allowing all material to clear prior to shutting down conveyors.
- 3. Emergency Stop activation and all system faults shall shut down conveyor regardless of selected system mode.

B. Manual reset shall be required prior to restarting the system in the event of any system fault. Control circuit shall latch on the indicator light associated with any system fault upon detection of fault condition.

### 2.04 FACTORY TESTING

- A. Factory inspection: Inspect control panel for required assembly criteria, component locations, labeling, and ratings. Verify control panel assembly and wiring has been performed neatly and with exceptional workmanship.
- B. Factory testing: Perform point-to-point continuity check per assembly drawings prior to applying appropriate voltage and performing complete test of control circuit functionality.

### 2.05 MAINTENANCE

- A. Furnish all special tools required for normal operation and maintenance of the equipment.
- B. Provide manufacturer's recommended spare parts for the equipment including: 10 belt pans, 20 guide blocks, 10 chain attachments, and 6 rubber scraper blades.
- C. Pack all spare parts for long-term storage in an unheated, unventilated, damp area in containers which are clearly identified on all sides with indelible markings as to contents.

### PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals and/or any pre-installation checklists. Installation shall utilize standard torque values and be installed secure in position and neat in appearance. Installation shall include any site preparation tasks as required by the engineer or manufacturer; such as unloading, touch-up painting, etc. and any other installation tasks and materials such as wiring, conduit, controls stands as determined by the customer and/or specified by the manufacturer.
- B. Anchor bolts and nuts shall be 316 stainless steel and furnished for each item of equipment by the Contractor.
- C. Anchor bolt template drawings shall be included in the submittal to permit verification of the location structural elements, new or existing in the concrete.

### 3.02 INSPECTION AND TESTING

A. After completion of installation, Contractor shall provide for testing and shall be performed in strict conformance with the manufacturer's start up instructions. Testing of the bar screen shall demonstrate that the equipment is fully operational by picking up and depositing materials into specified containment.

- B. Field certification shall include inspection of the following:
  - 1. Verify equipment is properly aligned and anchored per the installation instruction and drawings. Assure the bar screen unit is square, flat and unobstructed with required clearances maintained.
  - 2. Assure controls and instrumentation work in all modes.
  - 3. Check equipment for proper operation of debris blade, scrapers, etc as well as completion of the Start-Up requirements in the installation guide.
- C. Provide Manufacturer's Installation Certification

### 3.03 DEMONSTRATION

- A. Section 01700 Execution and Closeout Requirements: Demonstration and training.
- B. Demonstrate equipment operation, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION

# SECTION 11345 DUMPSTER

PART 1 GENERAL

# 1.01 SCOPE OF WORK

A. The contractor shall furnish two (2) dumpsters for screenings handling. One dumpster shall be placed as located on the drawings, and one dumpster shall be delivered to the Blue River Primary at 7300 Hawthorne Road.

### 1.02 SUBMITTALS

- A. Submit, in accordance with Section 01300, copies of all materials required to establish compliance with this Section. Submittals shall include the following:
  - 1. Product Data.

# PART 2 PRODUCTS

# 2.01 MANUFACTURERS

- A. Dumpster
  - 1. American Equipment

# 2.02 DUMPSTER

- A. 20 yard capacity with 22-foot main rails
- B.  $\frac{1}{4}$ " floor
- C. 3/16" top rail tubing with posts on 24" centers
- D. Front and rear ground rollers
- E. Dual attachments for cable and hooklift style
- F. Painted brown

# END OF SECTION

### SECTION 11350 ODOR CONTROL SYSTEM

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Two (2) hydroxyl radical fog odor control systems (base cabinet).
  - 2. Twelve (12) atomizing nozzles, fluid transfer hose assembly, clamping devices, supports, and related items.
  - 3. Installation assistance/inspection and equipment startup.
  - 4. Training of Owner's Personnel.
  - 5. Warranty

### 1.02 SYSTEM DESCRIPTION

- A. The specified equipment is designed to destruct odorous compounds within the proposed structure regardless of flows, temperature, or level.
  - 1. Atomizing nozzle generates hydroxyl radical fog and sprays it into odorous spaces, filling the headspace above the wastewater stream and chemically reacting with:
    - a. Vapor phase hydrogen sulfide, amines, other reduced sulfur compounds
    - b. Fats, Oils and Grease collecting above the surface of the wastewater
    - c. Biofilm and/or bacterial growth
  - 2. Process utilizes the volume of the structure as the reaction vessel for the odorous compounds-hydroxyl radical fog reaction to take place. The process will allow for an equilibrium concentration of both oxidants and odorous compounds to exist in the form of a stirred mixed reactor.
  - 3. Process consumes no external chemicals in its operation nor will there be any waste product to dispose of and, in particular, there will be no increase in total dissolved solids to the waste stream.
- B. The purpose of the hydroxyl fog is to destroy odorous compounds within the headspace, to remove any biofilm or bacterial growth covering the structure walls eliminating the typical corrosion effect associated with the low pH of the various biological processes, and to impart a residual oxidant to the structure space so as to be able to absorb any unexpected event within the influent piping.

# 1.03 PERFORMANCE REQUIREMENTS

A. Design Requirements: Provide the hydroxyl radical fog odor control systems to comply with the requirements listed in Table 1.

Table 1				
Hydroxyl Radical Fog Odor Control System Requirements				
Item	Requirements			
System Identification No	MILLI			
Atomizing Nozzles per Unit	6			
Oxidant Output	60 g/hr (maximum)			
Nozzle Water Consumption	Potable			
Supply Pressure	25-75 psi			
Flow Rate	8 gal/hour per nozzle			
Nozzlo Air Output	30 cfm per nozzle (average)			
Nozzie All Output	40 cfm per nozzle (maximum)			
Cooling Air Exhaust	150 scfm (maximum)			
Coverage Area	42,000 (maximum)			
Power Requirements	220 VAC, 30A, 60Hz, 1Ø			
Enclosure Type	Outdoor			

B. Additional materials shall be provided with the system shall be as listed in Table 2.

Table 2			
Additional S	ystem Requirements		
Component	Material		
Oxidant Tubing			
Material	Type 316 SS and Teflon		
Minimum supplied length	100 ft/nozzle		
Water Tubing			
Material	Low-density polyethylene		
Minimum supplied length	100 ft/nozzle		
Air Piping			
HV Nozzle	PVC (Supplied by Contractor)		
LV Nozzle (minimum supplied	Polyurethane (100 ft/nozzle)		
length)			
Nozzle			
HV Nozzle	Gray PVC		
LV Nozzle	Engineered Polymer		
Dasa Cabinat Matarial	Triglycidyl isocyanurate (TGIC)		
Base Cabillet Material	polyester coated aluminum		
	Triglycidyl isocyanurate (TGIC)		
	polyester coated aluminum		
RXN Vent			
Material	PVC		
Size	12"		
Zipper Cable Sheath			
Material	PVC, 2.5″		
Minimum supplied length			
Fasteners	Type 316 SS		
PLC/HMI	One (1) Red Lion PLC/HMI		

#### 1.04 SUBMITTALS

- A. Product Data: For Hydroxyl Radical Odor Control System
- B. Shop Drawings: For Hydroxyl Radical Odor Control System. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Structural supports and piping penetrations to be designed by Missouri licensed Professional Engineer.
  - 3. Wiring Diagrams: For power, signal, and control wiring.
- C. Information Submittals:
  - 1. Manufacturer's Certification of Compliance.
  - 2. Special shipping, storage and protection, and handling instructions.
  - 3. Manufacturer's instructions for installation.
  - 4. Manufacturer's Certificate of Proper Installation.
  - 5. Qualification Data: For manufacturer and manufacturer's representative, if applicable.
  - 6. Suggested spare parts list to maintain the equipment in service for a period of one year. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current pricing information.

### 1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
  - 1. The manufacturer shall have been in business for a minimum of ten (10) years.
  - 2. All equipment shall be the product of a manufacturer having at least ten (10) U.S. installations of the type being proposed, each with a minimum of five (5) years of satisfactory service.
  - 3. Hydroxyl radical production verified by an independent, third party (e.g. university or consulting engineer).
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle and store equipment components in accordance with shop drawings and manufacturer's written instructions.

### 1.07 PROJECT CONDITIONS

- A. System Arrangement:
  - 1. The equipment, sizes, materials, and arrangements described in this Specification section are typically based on recommendations by equipment manufacturers and shall be considered minimum limits of acceptability.
  - 2. Manufacturuer shall submit a piping, pipe support, and pipe penetration design by Missouri licensed Professional Engineer providing nozzles as located on the plans. Modifications to structural design due to a manufacturer's varying space requirements, foundation requirements, floor slope requirements, or dimension changes to fit manufacturer specific requirements shall be coordinated by Contractor and included in the Bid.
  - 3. The Contractor shall be responsible for any modifications to the piping, electrical, structural, mechanical layouts and ensure materials compatibility to accommodate the odor control system.
- B. Environmental Conditions
  - 1. All equipment including controls and drives specified herein shall be specifically designed for this service and the environment encountered in this installation.
  - 2. When installed in wastewater treatment areas, the environment will be moist, and corrosive, exhibiting hydrogen sulfide and other corrosive gases encountered in municipal wastewater treatment plants.
  - 3. Odor control unit is installed in a place at least 25' from the treatment area and limit exposure from hydrogen sulfide and other corrosive gases.
  - 4. Designed and capable of operation at ambient temperatures of 0°F to 100°F.
  - 5. Furnish heat tracing and insulation as required, if required for exterior installation. Insulation alone shall not be sufficient to fulfill freeze protection provisions of this section.

### 1.08 WARRANTY

A. Equipment Warranty: The equipment manufacturers shall include a warranty period of 12 months from equipment startup or 18 months from shipment whichever comes first.

#### PART 2 PRODUCTS

#### 2.01 MANUFACTURER AND MODEL

- A. Hydroxyl Radical Fog Odor Control system shall be VAPEX<sup>™</sup> MILLI Hydroxyl Radical Fog Odor Control System manufactured by Vapex<sup>™</sup> Environmental Technologies, LLC, Cocoa, FL.
- B. No substitution is permitted.

### 2.02 HYDROXYL RADICAL FOG ODOR CONTROL UNIT

- A. Hydroxyl radical fog generation system shall consist of two (2) primary subsystems; the base cabinet and the injection nozzles.
  - 1. Process module functions to deliver water, compressed air, and oxidant to the injection nozzle. Injection nozzle combines the three (3) raw components to form the atomized hydroxyl fog, where as the fog is released from the nozzle drives the reaction within the lift station space.
  - 2. The process module functions shall have the following attributes and capacities:
    - a. The base cabinet is water resistant, sound resistant and conforms to NEMA 3R specifications.
    - b. The oxidant generator is capable of producing a maximum of 60 grams per hour of ozone and modulates the oxidant output within this specified range.
    - c. The base cabinet shall include a compressor and an oxygen concentration unit that removes up to 95% of the nitrogen and water vapor prior to use by the oxygen discharge unit.
    - d. The base cabinet shall contain safety interlocks for low water flow, low nozzle air pressure, low oxygen concentration, low oxygen flow and high oxidant generator temperature. Any out of range condition will cause a shutdown of the affected system and will trigger an alarm.
    - e. The base cabinet shall be constructed of Triglycidyl isocyanurate (TGIC) polyester coated Aluminum with sound reduction and access panel gasketing. The cabinet shall be a rain-tight design, capable of operating with direct exposure to the elements.
    - f. The base cabinet shall include individual flow meters for water, oxygen and oxidant flow to the nozzles.
    - g. The equipment shall be manufactured to meet UL approved standards and will include CE or UL approval of electrical components (UL listing certification optional add 6 to 8 weeks to lead time).
    - h. The equipment shall include an Ethernet connection to connect to SCADA.
    - i. The equipment shall include a dry-contact relay for operation status.
    - j. All components inside the base cabinet shall be modular in design and require only basic tools to remove or maintain.
- B. The process module will have the following attributes and capacities:
  - 1. Ozone is generated using concentrated oxygen and a plasma generator.
  - 2. The plasma generator will be of a plasma type capable of the specified grams per hour ozone production. The plasma generator will be of a variable output design.
- 3. The process module includes a compressor and oxygen generation unit capable of removing 98% of the nitrogen and water vapor present in the cabinet prior to use by the plasma discharge units.
- 4. The air blower shall be of oil-less design capable of delivering the required air volume at the required pressures and shall have a minimum service life of 10,000 hours.
- 5. The process module shall contain safety interlocks for water flow, compressor low pressure, ozone generator over-temperature, and cooling fan operation. Any out-of-range condition will cause a shutdown of the affected are and will also cause and alarm contact set to be made.
- 6. The process module cabinet shall be constructed of TGIC polyester coated aluminum with sound proofing and access panel gasketing. The cabinet will be of a rain tight design capable of operating with direct exposure to the elements with no degradation in performance including ambient air temperatures up to 100°F
- 7. Flow meters shall be provided for water and air flow to the ozone generator.
- C. Atomizing Injection Nozzle:
  - 1. Designed and constructed, allowing 98% absorption of the produced ozone into the atomized water flow. The efficiency of the absorption process is directly tied to the size of the atomized water particle, which shall be no larger than 5-micron in diameter.
  - 2. Nozzle shall be adjustable, allowing an optimization of the air/water dispersion ratio. The adjustment will be by means of a simple threaded barrel requiring no tools or particular skill to accomplish the adjustment with the results being clearly obvious when observing the nozzle.
  - 3. Nozzle can be up to three hundred feet (300') from the process module.
- D. Miscellaneous Items:
  - 1. Provide the required lengths of special tubing, allowing the three fluids (air, oxidant, and water) to be transferred directly to the nozzle.
  - 2. Provide all supports, clamping devices, related components, and slip fit connections allowing for removal and inspection of the nozzle without the necessity of entering the odorous space or disassembling the injection plumbing.
  - 3. Inspection shall be able to be accomplished without the use of tools or specialized skills.

# 2.03 SOURCE QUALITY CONTROL

- A. Prior to shipment from the manufacturer, the odor control system shall be inspected and certified to operate and perform in connection with the usual purpose for which it is designed.
- B. All control panels shall be factory tested under simulated operating conditions verifying all devices function.
- C. Complete factory performance assurance testing shall be required prior to shipment.

# PART 3 EXECUTION

### 3.01 GENERAL

A. Install and adjust equipment in accordance with the Drawings, approved shop drawings, and the manufacturer's instructions. Do not operate the equipment until the installation is approved by the manufacturer's representative.

# 3.02 ASSEMBLY AND INSTALLATION

- A. Assemble and install equipment in accordance with the manufacturer's instructions.
  - 1. Remove temporary bracing supports and other construction debris that may damage equipment.
  - 2. Remove protective coatings and oils used for protection during shipment and installation.
  - 3. Check equipment for correct direction of rotation and freedom of moving parts.
  - 4. Align equipment to Manufacturer's tolerances.
  - 5. Adjust or modify equipment to ensure proper operation.
- 3.03 MANUFACTURER'S CERTIFICATES
  - A. Provide equipment manufacturer's Certificate of Installation stating that the equipment is installed per the manufacturer's recommendations and in accordance with the Drawings and Specifications.

# 3.04 MANUFACTURER'S SERVICES

- A. Manufacturer's Representative: Present at Project site or classroom designated by Owner, for 2 days.
- B. Services Provided:
  - 1. Furnish startup services.
  - 2. Furnish training of Owner's personnel.

# END OF SECTION

# SECTION 13721 ULTRASONIC LEVEL METERS (CONTINUOUS AND POINT TYPE)

PART 1 GENERAL

# 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.02 SUMMARY

- A. Section includes ultrasonic level meters.
- 1.03 ACTION SUBMITTALS
  - A. Product Data: For each type of product.
  - B. Shop Drawings.
- 1.04 INFORMATIONAL SUBMITTALS
  - A. Product Test Reports: For each Ultrasonic Level Meter, for tests performed by manufacturer and witnessed by a qualified testing agency.

### 1.05 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. One level indicating transmitter for each type of level element provided.

### 1.06 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

#### 1.07 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of ultrasonic level meter that fail(s) in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 2 year(s) from date of Substantial Completion.

# PART 2 PRODUCTS

#### 2.01 ULTRASONIC LEVEL/DIFFERENTIAL LEVEL METER

### A. Transducer:

- 1. Manufacturers:
  - a. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
    - 1) Siemens Automation Technology; Siemens AG Industry Sector.
    - 2) Rosemount
    - 3) Magnetrol
    - 4) Substitutions: Or approved equal.
- 2. Type:
  - a. Non-contact, ultrasonic level transducer.
  - b. Transducer: Remote mounted from transmitter.
- 3. Function/Performance
  - a. Measuring Range: Transducer range suitable for the installation indicated on the Drawings, up to 50 feet (15 meters).
  - b. Temperature Range: -4 to 140 degrees F (-20 to 60 degrees C).
  - c. Relative Humidity: Zero to 100 percent.
  - d. Beam Angle: 6 degrees or less.
  - e. Temperature Compensation: Provide transducers with integral temperature sensors for temperature compensation at above temperature ranges.
- 4. Physical:
  - a. Transducers: Potted/encapsulated in a Kynar or other chemical and corrosionresistant housing. Where indicated on the Drawings, transducers approved for installation in Class I, Division 1, Groups C and D (Zone 0) environments.
  - b. The surface of transducers: Teflon-coated where mounted on chemical tanks and exposed to vapors in the tanks that are not compatible with the transducer material.
  - c. Transducers: Capable of being completely submerged without damage.
  - d. Transducers: Suitable for surface, pipe, NPT fitting or flange mounting as indicated on the Drawings or Instrument Device Schedule. Provide appropriate mounting hardware. Flanges: 6 inch (150 mm) and resistant to attack by the medium being metered or, where required, protected by corrosion- resistant coatings and facings. All tank or well mounted transducers flanges to match the flange provided by the tank manufacturer or general contractor.
- 5. Options/Accessories Required
  - a. Provide transducers with special heaters or other type of transducer protection designed to prevent sensor icing where transducers are located in areas where freezing condensation may occur.
  - b. Signal cable as recommended by the manufacturer, for installation between the transducer (and the transmitter. Length, up to 1000 feet (300 meters), as required by installation indicated on the Drawings.

- B. Transmitter/Converter:
  - 1. Manufacturers:
    - a. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
      - 1) Siemens Automation Technology; Siemens AG Industry Sector Model HydroRanger 200.
      - 2) Rosemount
      - 3) Magnetrol
      - 4) Substitutions: Or approved equal.
  - 2. Type:
    - a. Microprocessor based compatible with the transducer(s) provided.
    - b. Transmitter: Remotely mounted from transducer.
  - 3. Functional/Performance:
    - a. Resolution (including transducer): Plus or minus 0.1 percent of range or 0.08 inches (2 mm), whichever is greater.
    - b. Accuracy (including transducer): Plus or minus 0.25 percent of range or 0.24 inches (6 mm).
    - c. Range: As required by the installation indicated on the Drawings and Instrument Device Schedule.
    - d. Temperature Range: -4 to 122 degrees F (-20 to 50 degrees F).
    - e. Output: Minimum two isolated 4-20 mA outputs and minimum four alarm contacts (number of contacts above 4 required of each device to be determined by signals required as shown on the drawings adjustable to trip at any point in the instrument range. Output contacts shall be rated 5 A at 230 VAC.
    - f. Temperature Compensation: Compensation over the temperature range of the sensor.
    - g. Display: Digital indicator displaying level/differential level or volume in engineering units or percent as indicated on the Drawings or in the Instrument Device Schedule.
    - h. Diagnostics: On-screen instructions and display of self- diagnostics.
    - i. Loss of Signal to Transmitter: Ignore momentary loss-of-echo signals and indicate loss of echo on the transmitter unit.
    - j. Configuration Protection: Protected programmable parameters using E2PROM. Battery backup protection is not acceptable.
  - 4. Physical
    - a. Transmitter: Suitable for surface or pipe stand mounting.
    - b. Enclosure: NEMA 4X (IP65).
    - c. A/C Power: 120vac.
  - 5. Accessories Required
    - a. Hand-held programmer where required for configuration and calibration of the instrument.

# 2.02 SOURCE QUALITY CONTROL

- A. Section 01400 Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Provide shop inspection and testing of completed assembly.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine walls, floors, roofs, and equipment for suitable conditions where ultrasonic level meter will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

### 3.03 IDENTIFICATION

- A. Refer to drawings for tagging designations.
- 3.04 FIELD QUALITY CONTROL
  - A. Ultrasonic level meters will be considered defective if it does not pass tests and inspections.

# 3.05 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. The start-up services include calibration, oversight of installations of the sensor, and start-up of the sensor/transmitter in order to provide reliable measurement at the instrument. The factory-authorized service representative or manufacturer shall verify the transmitter sends correct information to the control system (i.e., that the scaling and units are the same at the instrument and on the control system's operator interface/PLC). Submit an instrument calibration report in order to document the calibration procedure of the instruments.

# 3.06 MAINTENANCE SERVICE

A. Vendor Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include annual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacture's authorized replacement parts and supplies.

# 3.07 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.
- B. While starting up the instruments, the manufacturer shall provide training to the Owner's instrumentation technicians. The training shall be in how to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter. Training shall be provided one time and last up to 2 hours in the field.

# END OF SECTION

## SECTION 13779 COMBUSTIBLE GAS ANALYZERS

PART 1 GENERAL

# 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.02 SUMMARY

- A. Section includes combustible gas analyzers.
- 1.03 ACTION SUBMITTALS
  - A. Product Data: For each type of product.
  - B. Shop Drawings.
- 1.04 INFORMATIONAL SUBMITTALS
  - A. Product Test Reports: For each combustible gas analyzers, for tests performed by manufacturer and witnessed by a qualified testing agency.

### 1.05 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. One combustible gas analyzer for each type provided.

#### 1.06 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

# 1.07 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of combustible gas analyzers that fail(s) in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 2 year(s) from date of Substantial Completion.

# PART 2 PRODUCTS

#### 2.01 COMBUSTIBLE GAS/LEL DETECTOR

- A. Manufacturers:
  - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
    - a. MSA Ultima X Series sensors, GasGard XL Controller.
    - b. Substitutions: Or approved equal.

### B. Sensor:

- 1. Type:
  - a. Intrinsically safe.
  - b. Continuous infrared sensor.
- 2. Function/Performance:
  - a. Response Time: T90 in less than 30 seconds.
  - b. Temperature Range: -50 to 90 degrees C.
  - c. Sensor Life: 3 years typical.
- 3. Physical:
  - a. Infrared sensor technology.
  - b. Suitable for remote wall or ceiling mounting, or directly fitted to transmitter as indicated on the Drawings.
  - c. The sensor shall be mounted approximately 1-3ft. below the ceiling in accordance with manufacturer's recommendation.
- 4. Accessories Required:
  - a. Sufficient cable up to 50 ft (15 m) of the type recommended by the manufacturer shall be provided for installation between sensor and transmitter as required by the installation indicated on the Drawings.
  - b. Remote sensor enclosures shall be explosion proof, approved for Class 1, Division 1, Groups C and D areas.
- C. Remote Indicating Transmitter/Controller:
  - 1. Type:
    - a. Electronic, microprocessor based single channel transmitter compatible with sensor provided.
  - 2. Function/Performance:
    - a. Accuracy:  $\pm$  3 percent up to 50 percent LEL,  $\pm$ 5 percent for greater than 50 percent LEL.
    - b. Range: 0 to 100 percent LEL.
    - c. Environmental Conditions: -20 to 60 degrees C; 10 to 95 percent relative humidity.
    - d. Output: One 4-20 mA output proportional to calibrated range. Two programmable relay contacts for warning, alarm, and/or fault.
    - e. Display: Digital display indicating the gas level, alarm or fault messages, and diagnostic information.

- 3. Physical:
  - a. Explosion proof enclosure approved for Class 1, Division 1, Groups B, C, and D.
  - b. Suitable for surface mounting at elevation shown on drawings.
- 4. Accessories Required:a. Handheld programming unit if required for setup and calibration.
- D. Manufacturer Start-up and Training services:
  - 1. Provide manufacturer's start-up and training services as specified in the start-up and training services paragraph.

# PART 3 EXECUTION

# 3.01 EXAMINATION

- A. Examine walls, floors, and roofs for suitable conditions where combustible gas analyzers will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.02 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

# 3.03 IDENTIFICATION

- A. Refer to drawings for tagging designations
- 3.04 FIELD QUALITY CONTROL
  - A. Combustible gas analyzers will be considered defective if it does not pass tests and inspections.

# 3.05 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. The start-up services include calibration, oversight of installations of the sensor, and start-up of the sensor/transmitter in order to provide reliable measurement at the instrument. The factory-authorized service representative or manufacturer shall work

with the PCSS and AESS to verify the transmitter sends correct information to the control system (i.e., that the scaling and units are the same at the instrument and on the control system's operator interface/PLC). Submit an instrument calibration report in order to document the calibration procedure of the instruments.

# 3.06 MAINTENANCE SERVICE

A. Vendor Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include annual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacture's authorized replacement parts and supplies.

# 3.07 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.
- B. While starting up the instruments, the manufacturer shall provide training to the Owner's instrumentation technicians. The training shall be in how to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter. Training shall be provided one time and last up to 2 hours in the field.

# END OF SECTION

## SECTION 13783 HYDROGEN SULFIDE ANALYZERS

PART 1 GENERAL

### 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.02 SUMMARY

- A. Section includes hydrogen sulfide analyzers.
- 1.03 ACTION SUBMITTALS
  - A. Product Data: For each type of product.
  - B. Shop Drawings.
- 1.04 INFORMATIONAL SUBMITTALS
  - A. Product Test Reports: For each hydrogen sulfide analyzer, for tests performed by manufacturer and witnessed by a qualified testing agency.

#### 1.05 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. One hydrogen sulfide analyzer for each type provided.

#### 1.06 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

### 1.07 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of hydrogen sulfide analyzers that fail(s) in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 2 year(s) from date of Substantial Completion.

# PART 2 PRODUCTS

### 2.01 HYDROGEN SULFIDE DETECTOR

- A. Manufacturers:
  - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
    - a. MSA Ultima X Series sensors, GasGard XL Controllers.
    - b. Substitutions: Or approved equal.
- B. Sensor:
  - 1. Type:
    - a. Integral hydrogen sulfide gas sensors shall be the continuous diffusion type, which change resistance when exposed to hydrogen sulfide.
  - 2. Functional/performance:
    - a. Continuously measure, indicate, and transmit ppm concentration of hydrogen sulfide in air. The speed of response to a step change in gas concentration shall be less than 10 seconds to 90 percent of final reading.
  - 3. Physical:
    - a. The sensor shall be compact and of rugged construction to minimize accidental damage of materials and to resist corrosive atmospheres and poisoning of the sensor.
    - b. It shall have positive flame arresting protection and be suitable for installation in atmospheres falling under NEC Class I, Division I, Group D classifications.
    - c. The sensor shall be integral with the transmitter and be of explosion proof construction.
    - d. The sensor shall be mounted to prevent moisture accumulation.
    - e. The sensor shall be mounted approximately 1-3ft. above the floor in accordance with manufacturer's recommendation.
  - 4. Expendables:
    - a. The sensor shall have a useful life of 2 years under normal operating conditions.
  - 5. Accessories Required:
    - a. Sufficient cable up to 100 ft (30 m) of the type recommended by the manufacturer shall be provided for installation between sensor and transmitter as required by the installation indicated on the Drawings.
    - b. Mounting brackets for mounting as indicated on the Drawings.
    - c. If this is an international project, replace "Class 1 Division 1, Groups C and D" with EEx d IIC T4. In non-hazardous areas, remote sensor enclosures shall be NEMA 4X (IP65). Where indicated in the Instrument Device Schedule or on the Drawings to be installed in hazardous areas, enclosures shall be explosion proof, approved for Class 1, Division 1, Groups C and D areas.
    - d. Detectors that are mounted below 6 ft (2 m) above floor level shall be fitted with splash guards supplied by the manufacturer, to protect the sensor from accidental wetting.

- C. Remote Indicating Transmitter/Controller:
  - 1. Type:
    - a. Electronic, microprocessor-based transmitter compatible with sensor provided.
    - b. Single or dual channel as indicated on the Drawings or in the Instrument Device Schedule.
  - 2. Function/Performance:
    - a. Linearity:  $\pm 2$  percent of full scale.
    - b. Repeatability:  $\pm 1$  percent of full scale.
    - c. Range: 0 to 100 ppm.
    - d. Environmental Conditions: -20 to 50 °C and 0 to 95 percent relative humidity.
    - e. Output: One 4-20 mA output proportional to calibrated range. Two relay contacts for alarm and one fault relay contact.
    - f. Digital display indicating the gas level, alarm or fault messages, and diagnostic information.
  - 3. Physical:
    - a. NEMA 4X (IP65) enclosure approved for Class 1, Division 1, Groups C and D.
    - b. Suitable for surface mounting at elevation shown on drawings
    - c. A DC power supply shall be provided with each transmitter. The power supply shall be installed in an enclosure having the same certification as the enclosure for the transmitter. A/C power will be provided at the voltage and frequency stated in Section 409000.
  - 4. Accessories Required:
    - a. One-year supply of calibration and test gas for detectors indicated in the Instrument Device Schedule or on the Drawings.
    - b. Calibrator, fittings, hoses, and other devices require for calibration of detectors.
    - c. In lieu of the above, if the vendor offers a "Sensor Exchange" program as a standard offering, a year of this Sensor Exchange program is acceptable. This program shall deliver a freshly calibrated sensor at manufacturer recommended calibration intervals for replacement of the existing sensor. All information shall be uploaded to the transmitter for the new sensor with no further maintenance required for the new sensor to function properly.
- D. Manufacturer Start-up and Training services:
  - 1. Provide manufacturer's start-up and training services as specified in the start-up and training services paragraph.

# PART 3 EXECUTION

# 3.01 EXAMINATION

- A. Examine walls, floors, and roofs for suitable conditions where hydrogen sulfide analyzers will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- 3.03 IDENTIFICATION
  - A. Refer to drawings for tagging designations
- 3.04 FIELD QUALITY CONTROL
  - A. Hydrogen sulfide analyzers will be considered defective if it does not pass tests and inspections.

# 3.05 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. The start-up services include calibration, oversight of installations of the sensor, and start-up of the sensor/transmitter in order to provide reliable measurement at the instrument. The factory-authorized service representative or manufacturer shall work with the PCSS and AESS to verify the transmitter sends correct information to the control system (i.e., that the scaling and units are the same at the instrument and on the control system's operator interface/PLC). Submit an instrument calibration report in order to document the calibration procedure of the instruments.

#### 3.06 MAINTENANCE SERVICE

A. Vendor Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include annual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacture's authorized replacement parts and supplies.

# 3.07 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.
- B. While starting up the instruments, the manufacturer shall provide training to the Owner's instrumentation technicians. The training shall be in how to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter. Training shall be provided one time and last up to 2 hours in the field.

# END OF SECTION

#### SECTION 15086 DUCTWORK INSULATION

PART 1 GENERAL

# 1.1 RELATED SECTIONS

A. Section 15810 – Sheet Metal Ductwork

# 1.2 REFERENCES

- A. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - 1. ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. American Society for Testing and Materials International, (ASTM)
  - 1. ASTM B209, Specification for Aluminum and Aluminum Alloy Sheet and Plate.
  - 2. ASTM C335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
  - 3. ASTM C411, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - 4. ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - 5. ASTM C921, Standard Practice for Determining Properties of Jacketing Materials for Thermal Insulation.

# 1.3 DEFINITIONS

- A. For purposes of this section:
  - 1. "CONCEALED" insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
  - 2. "EXPOSED" will mean "not concealed" as defined herein.
  - 3. Insulation systems insulation material, fasteners, jackets, and other accessories.

# 1.4 SHOP DRAWINGS

- A. Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.
- B. Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

# 1.5 MANUFACTURERS' INSTRUCTIONS

- A. Submit manufacturer's installation instructions.
- B. Installation instructions to include procedures used and installation standards achieved.

### 1.6 QUALIFICATIONS

A. Installer: certified in performing work of this section, and have at least 5 years successful experience in this size and type of project, qualified to standards of TIAC.

### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- B. Protect from weather and construction traffic.
- C. Protect against damage from any source.
- D. Store at temperatures and conditions recommended by manufacturer.

### 1.8 WASTE MANAGEMENT AND DISPOSAL

- A. Remove from site and dispose of packaging materials at appropriate recycling facilities.
- B. Do no dispose of unused adhesive materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

#### PART 2 PRODUCTS

#### 2.1 FIRE AND SMOKE RATING

- A. In accordance with :
  - 1. Maximum flame spread rating: 25.
  - 2. Maximum smoke developed rating: 50.

### 2.2 INSULATION

- A. Mineral fiber: As specified includes fiber glass and rock wool.
- B. Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.
- C. All exterior ductwork shall be insulated. Exterior duct installation, where indicated on the drawings, shall be 3 1/2" thick , closed cell polyisocyanurate foam board ductwork insulation with an R-value of 22(°F \* ft \* hr)/BTU.

#### 2.3 DUCTWORK INSULATION LAGGING

- A. Aluminum:
  - 1. To ASTM B209 with moisture barrier as scheduled in PART 3 of this section.
  - 2. Ductwork insulation lagging shall be a 3003 aluminum lagging system with a sheet thickness of 0.032" and transverse joints that are flanged with gaskets and Pittsburgh lock seam joints for all longitudinal joints. Cross break all horizontal aluminum sheets 48 inches in width and greater. a Z-clip or H-bar lagging support system that accommodates the

Ductwork Insulation 15086 - 2 3 1/2" insulation thickness shall be used to support the aluminum lagging off either the aluminum or galvanized steel ductwork. Lagging support clips shall be screwed to both lagging and ductwork. A minimum of two longitudinal spans of lagging support clips shall be installed on each face of each duct or duct manifold.

3. A vapor barrier shall be installed between any external duct insulation and the insulation lagging.

# B. Stainless steel:

- 1. Type: 304 or 316 where additional corrosion protection is required.
- 2. Thickness: 0.25 mm sheet.
- 3. Finish: Corrugated or stucco embossed.
- 4. Jacket banding and mechanical seals:

# 2.4 ACCESSORIES

- A. Vapor retarder lap adhesive:
  - 1. Water based, fire retardant type, compatible with insulation.
- B. Indoor Vapor Retarder Finish:
  - 1. Vinyl emulsion type acrylic, compatible with insulation.

# PART 3 EXECUTION

# 3.1 PRE-INSTALLATION REQUIREMENTS

- A. Pressure testing of ductwork systems complete, witnessed and certified.
- B. Surfaces clean, dry, free from foreign material.

# 3.2 INSTALLATION

- A. Install in accordance with
- B. Apply materials in accordance with manufacturer's instructions and as indicated.
- C. Use two layers with staggered joints when required nominal thickness exceeds 3 inches.
- D. Maintain uninterrupted continuity and integrity of vapor barrier.
- E. Supports, Hangers in accordance with Section 23 05 29 Hangers and Supports for HVAC Piping and Equipment
- F. Fasteners: At a 12-inch spacing in the horizontal and vertical directions, minimum two rows each side.

# END OF SECTION

### SECTION 15192 NATURAL GAS PIPING

# PART 1 GENERAL

# 1.1 SUMMARY

- A. Section Includes
  - 1. Materials and installation for piping, valves and fittings for gas fired equipment.

# 1.2 RELATED SECTIONS

A. Section 01300 – Submittal Procedures.

# 1.3 **REFERENCES**

- A. American Society of Mechanical Engineers (ASME)
  - 1. ASME B16.5, Pipe Flanges and Flanged Fittings
  - 2. ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings
  - 3. ASME B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
  - 4. ASME B18.2.1, Square and Hex Bolts and Screws Inch Series.
- B. American Society for Testing and Materials International (ASTM)
  - 1. ASTM A 47, Standard Specification for Ferritic Malleable Iron Castings.
  - 2. ASTM A 53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
  - 3. ASTM B 75, Standard Specification for Seamless Copper Tube.
  - 4. ASTM B 837, Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems.
  - 5. ASTM D 2513, Standard Specification for Polyethylene(PE) Gas Pressure Pipe, Tubing and Fittings.
  - 6. ASTM D 2683, Standard Specification for Socket-Type Polyethylene(PE) Fittings for Outside Diameter-Controlled Polyethylene(PE) Pipe and Tubing.
  - 7. ASTM D 3261, Standard Specification for Butt Heat Fusion Polyethylene(PE) Plastic Fittings for Polyethylene(PE) Pipe and Tubing.

# 1.4 SUBMITTALS

- A. Submittals in accordance with Section 01 3300 Submittal Procedures.
- B. Product Data:
  - 1. Submit manufacturer's printed product literature, specifications and datasheet for piping, fitting and equipment.
  - 2. Indicate on manufacturer's catalog literature following: valves.

# 1.5 QUALITY ASSURANCE

# A. Pre-Installation Meeting:

- 1. Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.
  - a) Verify project requirements.
  - b) Review Installation and substrate conditions.
  - c) Coordination with other building subtrades.
  - d) Review manufacturer's installation instructions and warranty requirements.

### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Waste Management and Disposal:
- B. Remove from site and dispose of packaging materials at appropriate recycling facilities.

# PART 2 PRODUCTS

- 2.1 PIPE
  - A. Steel pipe: to ASTM A 53, Schedule 40, seamless as follows:
    - 1. NPS  $\frac{1}{2}$  to 2, screwed.
    - 2. NPS2 <sup>1</sup>/<sub>2</sub> and over, plain end.
  - B. Medium density polyethylene pipe: FOR UNDERGROUND USE ONLY and manufactured in accordance with ASTM D 2513.

# 2.2 **FITTINGS**

- A. Steel pipe fittings, screwed:
  - 1. Malleable iron: Conforming to ANSI B16.3, Class 150.
  - 2. Unions: Malleable iron, brass to iron, ground seat, to ASTM A47.
  - 3. Nipples: schedule 40, to ASTM A53.
- B. Polyethylene pipe fittings, socket type and butt heat fusion type.
  - 1. Socket-type polyethylene fittings that are manufactured in accordance with ASTM D 2683.
  - 2. But heat fusion polyethylene fittings that are manufactured in accordance with ASTM D 3261.

# 2.3 MANUAL SHUT-OFF VALVES

- A. 4-inch iron pipe size and under, full port, forged brass ball valve for two piece body construction complete with the following:
  - 1. Blowout-proof stem.
  - 2. Adjustable packing gland.
  - 3. Chrome-plated ball.

- 4. Class 150 WSP, 600 WOG.
- 5. Lever handle.
- 6. ANSI B1.20.1 NPT end connections

# PART 3 EXECUTION

# 3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions and datasheet.
- 3.2 PIPING
  - A. Install piping in accordance with the 2017 International Fuel Gas Code.
  - B. Slope piping down in direction to flow to low points.
  - C. Install drip points:
    - 1. At low points in piping system and where indicated.
    - 2. Provide complete with blowdown valve i.e. manual shut-off valve as specified above.
    - 3. Minimum 3 inches in length from tee connection in riser to top of valve. Size to be minimum NPS <sup>3</sup>/<sub>4</sub>. Provide complete with threaded end cap.
  - D. Use eccentric reducers at pipe size change installed to provide positive drainage.
  - E. Provide clearance for access and for maintenance.
  - F. Ream pipes, clean scale and dirt, inside and out.
  - G. Install piping to minimize pipe dismantling for equipment removal.
  - H. Field ending of piping to be prohibited.
  - I. Nesting of bushings to be prohibited. Utilize properly sized reducing fittings.
  - J. Do not utilize propane piping as an electrical ground.

# 3.3 VALVES

- A. Install valves with stems upright or horizontal unless approved otherwise by Owner.
- B. Install valves as indicated.

# 3.4 FIELD QUALITY CONTROL

- A. Site Tests/Inspection:
  - 1. Test system in accordance with 2017 International Fuel Gas Code.

# 3.5 ADJUSTING

- A. Purging: Purge after pressure test.
- B. Pre-Start-Up Inspections:
  - 1. Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
  - 2. Check gas trains, entire installation is approved by authority having jurisdiction.

# 3.6 CLEANING

A. Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

# 3.7 PURGING

A. Purge after pressure test.

# 3.8 **IDENTIFICATION**

A. Identify new piping

END OF SECTION

### SECTION 15723 PACKAGED, OUTDOOR MAKEUP AIR UNITS

PART 1 - GENERAL

#### 1.1 SUMMARY OF WORK

Specification for new makeup air units to be mounted outside on new concrete equipment pads on grade. These include two new makeup air units dedicated to the Main Operating Floor/Main Electrical Equipment Room and two dedicated to the Screen Room.

#### 1.2 SECTION INCLUDES

A. Packaged, outdoor, constant volume, direct-fired heating-only makeup air units.

#### 1.3 REFERENCES

A. 2017 International Mechanical Code

#### 1.4 SUBMITTALS

- A. Product Data: Provide complete performance data including rated capacities and fan performance curves with specified operating conditions for each makeup air unit.
- B. Product Data: Provide unit dimensions on drawings for each unit to be installed and include the location and dimensions of ductwork attachments; unit casing data including the type, thickness and insulating value of unit insulation; service/maintenance clearance requirements on all sides; and the weight of each unit. Also include natural gas connection information.
- C. Product Data: Submit manufacturer's electrical requirements (including the MCA and MOCP) for power supply wiring for each makeup air unit and motor data. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Product Data: Provide sound performance data resulting from AMCA-compliant testing.
- E. Submittals shall include installation requirements and Operating and Maintenance Manuals for each unit. Submit maintenance data and parts list for each gas-fired makeup air unit, integral unit controls provided, and all accessories. Also include "trouble-shooting" maintenance guide and include this information in the Operating and Maintenance manuals.
- F. Network interface controller specifications including available options and operating protocols. Include complete data on all factory-supplied input devices and acknowledge compatibility with the communication protocol used by the existing building automation system or energy management and control system.
- G. Substitution of any product other than that specified, must ensure no deviation below the stated capacities, airflow rate, heat transfer rate and filtration efficiency. Power requirements must also not be exceeded. Applications for "equivalent" or "alternate" acceptance must address all of these factors. Modular units assembled to achieve a close proximation to the intent of this specification will not be considered equal.

#### 1.5 QUALITY ASSURANCE

- A. All equipment shall, where specified and applicable, be pre-wired, and factory certified by an approved testing agency such as ETL<sub>US</sub>, UL, prior to shipment. Pre-wired units shall bear an approved label with all the necessary identification marks, electrical data.
- B. Source Limitations: Obtain makeup air units with integral supply air heating capability with all appurtenant components or accessories from a single manufacturer.

### 1.6 PRODUCT STORAGE, HANDLING AND DELIVERY

- A. Unless stated otherwise, units are to be shipped to the job in one piece, factory assembled.
- B. Handle units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged units or components; replace with new.
- C. Comply with Manufacturer's rigging and installation instructions for unloading units, and moving them to final location.
- D. Store units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris and physical damage.

#### 1.7 WARRANTY

- A. Manufacturer's Warranty: Submit, for the Kansas City, Missouri, Water Services Department acceptance, a manufacturer's standard warranty document for a minimum one-year warranty. Manufacturer's warranty is in addition to, and not a limitation of, other rights that the owner may have under these contract documents.
- B. The warranty of this equipment is to be free from defects in material and workmanship for a period of one year from the purchase date.
- C. Any electric motor(s) that is integral to the unit shall be warranted by the motor manufacturer for a period of one year. Should motors furnished by the manufacturer prove defective during this period, they can be returned and will be replaced by the makeup air unit manufacturer.

#### PART 2 – PRODUCTS

#### 2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide makeup air units as specified and with specific sizes, capacities, ratings, performance requirements and salient characteristics identified in the equipment schedule(s) on the drawings. Furnish makeup air units listed in the equipment schedule(s) that were selected as the basis of design or equivalent models from the manufacturers listed below in alphabetical order:
  - 1. Engineered Air
  - 2. Greenheck Fan
  - 3. Trane Technologies (Trane Company)

#### 2.2 UNIT CONSTRUCTION

- A. Unit casing and unit casing floors shall be of minimum 16-gauge stainless steel sheet metal. Surfaces shall be cleaned with a degreasing solvent to remove oil and metal oxides.
- B. All walls, roofs and floors for the unit casing shall be of formed construction, with at least two breaks at each joint. Joints shall be secured by sheet metal screws or pop rivets. Wall and floor joints shall be broken in and on all outdoor units roof joints broken out (exposed) for rigidity. All joints shall be caulked with a water-resistant sealant.
- C. Unit shall be provided with a 22-gauge solid stainless steel metal liner over all insulated areas.
- D. Units shall be provided with stainless steel hinged access doors, with e-profile gasket, fully lined, and a minimum of two lever handles.
- E. Units shall be provided with access doors to the following components: fans and motors, filters, dampers and operators, access plenums, electrical control panels, burner compressor compartments. Access doors shall be large enough for easy access. Removal of screwed wall panels will not be acceptable.
- F. All units shall be internally insulated with 2" thick 1 1/2 lb./cu.ft. density fiberglass insulation.
- G. Air handling units shall be weatherproofed and equipped for installation outdoors. This shall include generally for the prevention of infiltration of rain and snow into the unit, hoods on air intakes, all joints caulked with a water-resistant sealant; roof joints turned up 2" with three break interlocking design; outer wall panels extend a minimum of 1/4" below the floor panel.

#### 2.3 FANS

- A. Centrifugal fans shall be rated in accordance with AMCA Standard Test Code, Bulletin 210. Fan manufacturer shall be a member of AMCA. All fans and fan assemblies shall be dynamically balanced during factory test run. Fan shafts shall be selected for stable operation at least 20% below the first critical RPM. Fan shafts shall be provided with a rust inhibiting coating.
- B. All forward-curved fan assemblies shall be equipped with greaseable pillow block bearings, supported on a rigid structural steel frame.
- C. All forward-curved fan assemblies, excluding aluminum and stainless steel components, shall be coated in a two-component epoxy coating.
- D. Drives shall be adjustable on fans with motors 7 1/2 HP or smaller. On fans with larger motors, fixed drives shall be provided. All drives shall be provided with a rust inhibiting coating. The air balancer shall provide for drive changes (if required) during the air balance procedure.
- E. Motor, fan bearings and drive assembly shall be located inside the fan plenum to minimize bearing wear and to allow for internal vibration isolation of the fan-motor assembly, where required. Motor mounting shall be adjustable to allow for variations in belt tension.

- F. Provide OSHA-compliant belt guards.
- G. Fan-motor assemblies shall be provided with vibration isolators. Isolators shall be bolted to steel channel welded to unit floor, which is welded to the structural frame of the unit. All fans shall incorporate vertical spring type isolators with leveling bolts, bridge bearing waffled pads with minimum 1" static deflection designed to achieve high isolation efficiency. Fans shall be attached to the discharge panel by a stainless steel flexible fabric, with a sealed double locking fabric to metal connection.
- H. Provide stainless steel extended grease lines both to exterior of casing.
- I. Fan motors shall be TEFC (totally enclosed fan cooled) Super E high efficiency.

### 2.4 MAKEUP AIR UNIT HEATING SECTION – DIRECT-FIRED NATURAL GAS

- A. Each make-up air unit shall be equipped with a direct-fired natural gas furnace section and be ETL<sub>US</sub> approved as a complete package including accessories and controls for both sea level and high-altitude areas.
- B. Operating natural gas pressure at unit manifold shall be 6 to 10 in. w.c.
- C. Heating Section Burner
  - 1. Burner assembly shall be a line type (Engineered Air Green burn burner) with a modulating turn down ratio of 25:1.. The assembly shall be constructed in a draw-through arrangement. Outside air will be drawn across the burner section at a constant velocity within the allowable limits of the burner design.
- 2. All burner combustion air openings shall be located in stainless steel burner plates to maintain design combustion air requirements at all inputs. Combustion air openings in burner castings are not acceptable due to potential blockage from corrosion. Gas orifices shall be a maximum of ½" apart and gas burner connection size shall be 1 ½" minimum in order to ensure full turndown performance.
- 3. Burner assembly and piping to include modulating flow ratio valve, fail-safe shut off valve(s), main and pilot pressure regulators, manual shut off valves and electric pilot valve. Flame surveillance shall be with a solid-state programmed flame relay complete with flame rod. The gas train shall be in a cabinet enclosure.
- 4. Burner Controls
  - a. Unit shall start from exhaust system interlock (by others) wired to unit control terminal strip as indicated on field wiring diagram. Unit discharge air temperature shall be maintained constant by a discharge air sensor which shall modulate the main flow ratio gas valve.
  - b. HE series direct fired burners shall be equipped with a programmed logic controller to provide discharge air temperature control and burner management functions.
  - c. Electronic sensor shall modulate the gas valve through an amplifier. An electronic temperature selector unit mounted shall be capable of adjusting the discharge air temperature set point.

- d. Provide ambient lockout thermostat, unit mounted, to lock out heat at 50°F.
- e. Factory testing of direct fired gas heating section.
  - 1) Tests shall be performed after complete final unit assembly, just prior to shipping to job site. The tests shall be performed in accordance with the equipment standard that the gas heating section is certified.
  - 2) Burner shall be clocked with a dedicated calibrated gas meter to ensure proper set up of the gas manifold to match the flow rate to the application.
  - 3) The blower flow rate shall be set to the design airflow conditions.
  - 4) Controls shall be checked and set to ensure proper operation as per unit order.

#### 2.5 AIR FILTERS

- A. Filter sections shall be provided with adequately sized access doors to allow easy removal of filters. Filter removal shall be from one side as noted on the drawings.
- B. 2" Pleated Panel Disposable Filters: An optimum blend of natural and synthetic fiber media with a rust resistant support grid and high-wet strength beverage board enclosing frame with diagonal support members bonded to the air entering and air exiting side of each pleat. Permanent re-usable stainless steel enclosing frame. The filter media shall have a minimum efficiency of 30-35% on ASHRAE Standard 52.1-92, and a minimum of MERV 8 per ASHRAE 52.2. Rated U.L. Class 2.
- C. Provide filter bank with "Dwyer 2000 magnehelic" air filter gauge complete with static pressure tips and aluminum tubing all factory-installed. Filter gauge to have a range of 0 to 2".

#### 2.6 DAMPERS

- A. Damper frames shall be U-shaped stainless steel sections securely screwed or welded to the air handling unit chassis. Pivot rods of 1/2" aluminum shall turn in nylon or bronze bushings. Rods shall be secured to the blade by means of straps and set screws.
- B. Blades shall be 18 gauge stainless steel with two breaks on each edge and three breaks on centerline for rigidity. The pivot rod shall "nest" in the centerline break. Damper edges shall interlock. Maximum length of damper between supports shall be 48". Damper linkage brackets shall be constructed of galvanized metal.
- C. Dampers shall be standard construction and include blade end seals with an adhesive backed foamed polyurethane gasketing. Outdoor air dampers also include an all-weather PVC seal fastened with a positive lock grip and pliable overlap edge on entering air side of interlocking edges. Dampers are interlocked from the center.
- D. Two position inlet dampers shall be parallel-blade type.
- E. Makeup Air Inlet Damper Control shall provide a two position, normally closed electric damper operator. This damper operator shall be interlocked so that when the unit is shut down, or on a power failure, the damper shall return to the closed position.

#### 2.7 FACTORY-SUPPLIED MAKEUP AIR UNIT CONTROLS AND CONROL WIRING

- A. Provide a system of motor control, including all necessary terminal blocks, motor contactors, motor-overload protection, grounding lugs, control transformers, auxiliary contactors and terminals for the connection of external control devices or relays.
- B. Natural gas -fired units shall also include high limit and combustion airflow switches.
- C. Fire alarm circuits (where required) shall be powered from a relay in unit circuitry.
- D. Factory installed and wired non-fused disconnect switch in NEMA 4X configuration c/w safety lockout contact.
- E. Provide a discharge air low-limit circuit equipped with an automatic by-pass time delay to allow for cold weather start-up. On a heating system failure, this device will shut down the fan and close the outdoor air damper.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance.
- B. Examine roughing-in of natural gas piping, electrical conduit and ductwork to verify actual location and compliance with unit requirements.

### 3.2 INSTALLATION

A. Installation shall be accomplished in accordance with these written specifications, project drawings and manufacturer's installation instructions as documented in the manufacturer's installation documents and the Operation and Maintenance Manual as well as all applicable building codes.

#### 3.3 CONNECTIONS

- A. In all cases, industry best practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
  - 1. Natural gas piping installation requirements are specified in Division 22 of the specifications. Drawings indicate general arrangement of piping, fittings and specialties.
  - 2. Ductwork installation and connection requirements are specified in Division 23 of the specifications.
  - 3. Electrical installation requirements are specified in Division 26 of the specifications.

#### 3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist.

# 3.5 START-UP SERVICE

- A. Provide services of a factory trained service personnel for one 8-hour period to provide starting procedures for direct-fired, makeup air units:
  - 1. A NEBB-Certified testing, adjusting and balancing (TAB) contractor shall be engaged to provide all required TAB services and start-up services.
  - 2. The testing, adjusting and balancing (TAB) contractor shall energize motor, verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM. Replace fan and motor pulleys as required to achieve design conditions.
  - 3. Clean entire unit as necessary and install clean air filters.
  - 4. The testing, adjusting and balancing (TAB) contractor shall measure and record motor electrical values for voltage and amperage on all new makeup air units.
  - 5. The testing, adjusting and balancing (TAB) contractor shall provide the Project Engineer with a complete log of all TAB services completed along with a NEBB-certified testing, adjusting and balancing report for each new and existing makeup air unit that has been installed as a part of this project or that is reused as indicated on the drawings and in the specifications.

# 3.6 DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit.

END OF SECTION

### SECTION 15810 SHEET METAL DUCTWORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Rectangular ducts and fittings.
  - 2. Duct liner.
  - 3. Sealants and gaskets.
  - 4. Ductwork Hangers and supports.
- B. Related Sections:
  - 1. Section 15723 Packaged, Outdoor Air Makeup Air Units

### 1.3 SUBMITTALS

- A. Product Data: For each type of the following products:
  - 1. Rectangular ductwork.
  - 2. Duct liner and adhesives.
  - 3. Sealants and gaskets.
- B. Sustainable Design Submittals:
  - 1. Product Data: For adhesives, indicating VOC content.
  - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for lowemitting materials.
  - 3. Product Data: For sealants, indicating VOC content.
  - 4. Laboratory Test Reports: For antimicrobial coatings, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings:
  - 1. Submit shop drawings for the fabrication, assembly, and installation of all ductwork, ductwork supports and identify ductwork hangers to be used.

#### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards Metal and Flexible"
- C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.
- D. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

#### 2.2 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" based on indicated static pressure class unless otherwise indicated.
  - 1. Construct ducts, inside and outdoors, of Type 3003 aluminum unless otherwise indicated.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
  - 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
  - 2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible." All longitudinal seams shall be Pittsburgh lock seams unless otherwise specified for specific application.
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

#### 2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards -Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Type 3003 aluminum shall be used to fabricate all new ductwork as shown on the drawings.
- C. Aluminum Sheets: Comply with ASTM B209, and provide Type 3003 aluminum sheet with H14 temper and mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- D. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inchminimum diameter for lengths longer than 36 inches.

# 2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Corporation; or comparable product by one of the following:
    - a. Johns Manville.
    - b. Knauf Insulation.
    - c. Owens Corning.
  - 2. Maximum Thermal Conductivity:
    - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
    - b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
  - 3. **Solvent**-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.
    - a. Adhesive shall have a VOC content of 80 g/L or less.
- B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C534/C534M, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. Ductmate Industries, Inc.

- 2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- 3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
  - a. Adhesive shall have a VOC content of 80 g/L or less.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
  - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
  - 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
  - 3. Butt transverse joints without gaps, and coat joint with adhesive.
  - 4. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
  - 5. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
    - a. Fan discharges.
    - b. Intervals of lined duct preceding unlined duct.
    - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

### 2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
  - 1. Application Method: Brush on.
  - 2. Solids Content: Minimum 65 percent.
  - 3. Shore A Hardness: Minimum 20.
  - 4. Water resistant.
  - 5. Mold and mildew resistant.
  - 6. VOC: Maximum 75 g/L (less water).
  - 7. Maximum Static-Pressure Class: 10 inch wg (2500 Pa), positive and negative.
  - 8. Service: Indoor or outdoor.
  - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Solvent-Based Joint and Seam Sealant:
  - 1. Application Method: Brush on.
  - 2. Base: Synthetic rubber resin.
  - 3. Solvent: Toluene and heptane.
  - 4. Solids Content: Minimum 60 percent.

- 5. Shore A Hardness: Minimum 60.
- 6. Water resistant.
- 7. Mold and mildew resistant.
- 8. Sealant shall have a VOC content of 420 g/L or less.
- 9. Maximum Static-Pressure Class: 10-in. w.c., positive or negative.
- 10. Service: Indoor or outdoor.
- 11. Substrate: Compatible with galvanized sheet steel, stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C920.
  - 1. General: Single-component, acid-curing, silicone, elastomeric.
  - 2. Type: S.
  - 3. Grade: NS.
  - 4. Class: 25.
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

### 2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports:
  1. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

# PART 3 - EXECUTION

#### 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a minimum clearance of 1 inch, plus allowance for insulation thickness.
- H. Install fire and smoke dampers where indicated on drawings and as required by code, and by local authorities having jurisdiction.
- I. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation.
- J. Elbows: Use long-radius elbows wherever they fit.
  - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
  - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.
- K. Branch Connections: Use lateral or conical branch connections.

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- D. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.3 DUCTWORK EXPOSED TO WEATHER

- A. All external joints are to have secure watertight mechanical connections. Seal all openings to provide weatherproof construction.
- B. Single Wall:
  - 1. Ductwork shall be Type 3003 aluminum.
  - 2. Where ducts have external insulation, provide weatherproof aluminum jacket.

### 3.4 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible":
  - 1. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
  - 2. Outdoor, Supply-Air Ducts: Seal Class A.
  - 3. Outdoor, Exhaust Ducts: Seal Class C.
  - 4. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch w.c. and Lower: Seal Class B.
  - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch w.c.: Seal Class A.
  - 6. Unconditioned Space, Exhaust Ducts: Seal Class C.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 5-1.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

#### 3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors."
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.
## 3.7 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

### 3.8 STARTUP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."
- B. Duct Liner:
  - 1. Supply-Air Ducts: inches thickness.
  - 2. Exhaust-Air Ducts: inches thickness.

END OF SECTION

## SECTION 15835 ROOF-MOUNTED EXHAUST FANS

## PART 1 – GENERAL

- 1.1 SUMMARY
  - A. Section includes:
    - 1. Roof-mounted exhaust fans.

# 1.2 RELATED SECTIONS

A. Section 15926 – Direct Digital Control System – Outdoor Air Ventilation Equipment

## 1.3 REFERENCES

- A. American Bearing Manufacturers Association (ABMA)
- B. Air Movement and Control Association (AMCA)
  - 1. AMCA Publication 99, Standards Handbook (Revised 2003).
  - 2. AMCA 300, Reverberant Room Method for Sound Testing of Fans.
  - 3. AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- C. American National Standards Institute (ANSI)
  - 1. ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

## 1.4 SYSTEM DESCRIPTION

- A. Performance Requirements:
  - 1. Published ratings form catalogs for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force. Provide confirmation of testing.
  - 2. Capacity: flow rate, total static pressure Pa, r/min, bhp W, model and size and sound ratings as indicated on schedule.
- B. Statically and dynamically balanced. Constructed to AMCA 99.
- C. Sound ratings: comply with AMCA 301, tested to AMCA 300. Unit shall bear AMCA certified sound rating seal.
- D. Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, unit to bear AMCA certified rating seal.
- E. Bearings: Sealed lifetime ball bearings, heavy duty grease lubricated ball or roller bearings of self aligning type with oil retaining, dust excluding seals and a certified minimum rated L10 life of 100,000 hours.

## 1.5 SUBMITTALS

- A. Product Data:
  - 1. Submit manufacturer's printed product literature, specifications and datasheets. Include product characteristics, performance criteria, and limitations.
- B. Shop Drawings:
  - 1. Provide shop drawing submittals for the following:
    - a. Fan performance curves showing specified point of operation.
    - b. Sound rating data.
    - c. Installation procedures.
- C. Quality assurance submittals: submit the following:
  - 1. Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - 2. Instructions: submit manufacturer's installation instructions.
- D. Closeout Submittals
  - 1. Provide operation and maintenance data for incorporation into overall project Operations and Maintenance Manual.

### 1.6 QUALITY ASSURANCE

- A. Performance ratings: Conform to AMCA Publication's 211-13 and 311-16 for fan air performance and fan sound performance. Fans must be tested in accordance with AMCA Standard 210-16 and AMCA Standard 300-14 in an AMCA accredited laboratory. Fans shall be certified to bear the AMCA label for air performance seal.
- B. Classification for Spark Resistant Construction shall conform to the intent of AMCA Standard 99-16.
- C. Each fan shall be given a balancing analysis which is applied to wheels at the outside radius. The maximum allowable static and dynamic imbalance is 0.05 ounces (Balance grade of G6.3).
- D. Comply with the National Electrical Manufacturers Association (NEMA), standards for motors and electrical accessories.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, handling and unloading:
  - 1. Deliver, store and handle in accordance with
  - 2. Deliver, store and handle materials in accordance with manufacturer's written instructions.
- B. Waste Management and Disposal:
  - 1. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling, if appliable.

#### 1.8 MAINTENANCE

- A. Extra Materials:
  - 1. Provide maintenance materials in accordance with Section 01 78 00 Closeout Submittals.
- B. Furnish list of individual manufacturer's recommended spare parts for equipment, include:
  - 1. Bearings and seals.
  - 2. Belts.
  - 3. Addresses of suppliers.
  - 4. List of specialized tools necessary for adjusting, repairing or replacing.

### PART 2 - PRODUCTS

- 1.9 FANS GENERAL
  - A. Capacity: flow rate, static pressure Pa, r/min, bhp, model and size and sound ratings as indicated on schedule.
  - B. Statically and dynamically balanced. Constructed in conformity with AMCA 99.
  - C. Sound ratings: comply with AMCA 301, tested to AMCA 300.
  - D. Performance ratings: based on tests performed in accordance with ANSI/ASHRAE 51/AMCA 210.
  - E. Bearings: sealed lifetime ball bearings or heavy duty grease lubricated ball or roller bearings of self aligning type with oil retaining, dust excluding seals and a certified minimum rated life to ABMA L10 of 100,000 h.

## 1.10 ROOF-MOUNTED EXHAUST FANS

- A. Centrifugal v-belt or direct driven.
  - 1. Housings: Spun aluminum complete with resilient mounted motor and fan.
  - 2. Impeller: Aluminum non-overloading.
  - 3. Adjustable motor sheave.
  - 4. <sup>1</sup>/<sub>2</sub>-inch mesh aluminum birdscreen.
  - 5. Insulated aluminum back draft damper to be installed in the base of the roof curb for each exhaust fan.
  - 6. Weatherproof disconnect switch within fan housing.
  - 7. Roof curb, 14-inch high, continuous curb gaskets, stainless steel securing bolts and screws. Hinge curb plate for access to internals for maintenance.
- B. Sound curbs: of same manufacturer as fan and built to suit model specified.
  - 1. Double baffle and self-flashing type. Required decibel sound attenuation spectrum:

Frequency Octave	1	2	3	4	5	6	7	8
dB Attenuation	3	5	11	16	22	20	17	13

C. Two speed fan motors: two windings or split windings with speeds of approximately 1800 RPM high and 900 RPM.

## PART 3 - EXECUTION

### 1.11 MANUFACTURER'S INSTRUCTIONS

A. Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

### 1.12 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- A. Install fans for grease exhaust fans in accordance with NFPA 96.

## 1.13 CLEANING

A. Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

### END OF SECTION

## SECTION 15926

# DIRECT DIGITAL CONTROL SYSTEM – OUTDOOR AIR VENTILATION EQUIPMENT

## PART 1 - GENERAL

- 1.1 SUMMARY OF WORK
  - A. A new direct digital control(DDC) system operating with the BACnet and MS/TP protocols shall control the operation of four(4) new 100% outdoor air makeup air units(each equipped with direct-fired heating capability), two(2) existing 100% outdoor air makeup air units(each equipped with direct-fired heating capability), three(3) new roof-mounted exhaust fans, three(3) existing roof-mounted exhaust fans and one(1) indoor, floor-mounted centrifugal exhaust fan. The DDC control system shall reuse the existing Automated Logic-brand main building controller and the existing I/O expander panel and continue to provide stand-alone control over the new makeup air units, two existing makeup air units to be reused, new roof-mounted exhaust fans and existing exhaust fans to be reused. A second expander panel will need to be added only to accommodate additional input and output points. The DDC control system shall be interconnected with and able to report real-time data and alarms/alarm status back to the existing, main Allen-Bradley PLC panel controlling the overall wastewater pump station and make that data available to the plant operator using graphic display screens on the existing Allen-Bradley PLC system interface.
- 1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION
  - A. Automatic Airflow Volume Control Dampers
  - B. Manual Airflow Dampers
  - C. Turning Vanes
  - D. Duct-Mounted Access Doors
  - E. Flexible Connectors
- 1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION A. None.
- 1.4 PRODUCTS NOT FURNISHED OR INSTALLED UNDER THIS SECTION BUT INTEGRATED WITH THE WORK OF THIS SECTION
  - A. Section 15835 Exhaust Fans
     1. Roof-Mounted Exhaust Fans
  - B. Section 15723 Packaged, Outdoor Makeup Air Units
    - 1. 100% Outdoor Air(OA) Makeup Air Units
- 1.5 RELATED SECTIONS
  - A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents.
  - B. The following sections include related work:
    - 1. Section 15820 Sheet Metal Ductwork
    - 2. Section 15835 Exhaust Fans
    - 3. Section 15723 Packaged, Outdoor Makeup Air Units
- 1.6 DESCRIPTION
  - A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and an operator workstation. The operator workstation shall provide for overall system supervision and configuration, graphical user interface, management report generation, and alarm annunciation.

## 1.7 APPROVED CONTROL SYSTEM PRIMARY MANUFACTURERS

- A. The following are approved control system manufacturers and product lines:
  - 1. Automated Logic Corporation Carrier Global Corporation
  - 2. Honeywell Building Technologies
  - 3. Trane Technologies, Inc.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

Note:

- 1. The order of the above list of manufacturers does not indicate preference. Inclusion on this list does not guarantee acceptance of products or installation. Control systems shall comply with the terms of this specification.
- 2. Use operator workstation software, controller software, custom application programming language, building controllers, custom application controllers, and application specific controllers only from one of the manufacturers and product lines listed.
- 3. Other products specified herein (such as sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

## 1.8 QUALITY ASSURANCE

- A. Installer and Manufacturer Qualifications
  - 1. Installer shall have an established working relationship with Control System Manufacturer of not less than three years.
  - 2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present certification of completed training including hours of instruction and course outlines.

## 1.9 CODES AND STANDARDS

- A. Work, materials, and equipment shall comply with the following:
  - 1. National Electrical Code
  - 2. International Building Code
  - 3. International Mechanical Code
  - 4. ASHRAE/ANSI 135-2001: Data Communication Protocol for Building Automation and Control systems (BACnet)

## 1.10 SYSTEM PERFORMANCE

- A. Performance Standards. System shall conform to the following minimum standards over network connections:
  - 1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 seconds.
  - 2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 seconds.
  - 3. Object Command. Devices shall react to command of a binary object within 2 seconds. Devices shall begin reacting to command of an analog object within 2 seconds.
  - 4. Object Scan. Data used or displayed at a controller or workstation shall have been current within the previous 6 seconds.
  - 5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 seconds.
  - Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. Select execution times consistent with the mechanical process under control.
  - Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per second. Select execution times consistent with the mechanical process under control.
  - 8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 seconds of other workstations.
  - 9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
  - 10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Reporting Accuracy			
Measured Variable	Reported Accuracy		
Space Temperature	±0.5°C (±1°F)		
Ducted Air	±0.5°C (±1°F)		
Outside Air	±1.0°C (±2°F)		

TADIE

Birmingham Pump Station Screen Replacement Kansas City, Missouri

Measured Variable	Reported Accuracy
Dew Point	±1.5°C (±3°F)
Water Temperature	±0.5°C (±1°F)
Delta-T	±0.15° (±0.25°F)
Relative Humidity	±5% RH
Water Flow	$\pm 2\%$ of full scale
Airflow (terminal)	$\pm 10\%$ of full scale (see Note 1)
Airflow (measuring stations)	$\pm 5\%$ of full scale
Airflow (pressurized spaces)	$\pm 3\%$ of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	$\pm 2\%$ of full scale (see Note 2)
Electrical	$\pm 1\%$ of reading (see Note 3)
(A, V, W, Power Factor)	
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO <sub>2</sub> )	±50 ppm

Note 1: Accuracy applies to 10%–100% of scale Note 2: For both absolute and differential pressure Note 3: Not including utility-supplied meters

#### TABLE 2 Control Stability and Accuracy

Controlled	Control Accuracy	Range of Medium
Variable		
Air Pressure	±0.2 in. w.g.	0–6 in. w.g.
	±0.01 in. w.g.	-0.1 to 0.1 in. w.g.
Airflow	$\pm 10\%$ of full scale	
Space Temperature	±2.0°F	
Duct Temperature	±3°F	
Humidity	±5% RH	
Fluid Pressure	±1.5 psi	1–150 psi
	±1.0 in. w.g.	0–50 in. w.g. differential

## 1.11 SUBMITTALS

- A. Product Data and Shop Drawings: Meet requirements of Section 01xxx on Shop Drawings, Product Data, and Samples. In addition, Contractor shall provide shop drawings or other submittals on all hardware, software, and installation to be provided. No work may begin on any segment of this project until submittals have been successfully reviewed for conformity with the design intent. Six copies are required. Provide drawings as AutoCAD 2004 (or newer) compatible files on optical disk (file format: .dwg, .dxf, .vsd, or comparable) with three 11" x 17" prints of each drawing. When manufacturer's cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:
  - 1. Direct Digital Control System Hardware:
    - a. A complete bill of materials of equipment to be used indicating quantity, manufacturer, model number, and other relevant technical data.
    - b. Manufacturer's description and technical data, such as performance curves, product specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:
      - 1) Direct Digital Controller (controller panels)
      - 2) Transducers/Transmitters

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- 3) Sensors (including accuracy data)
- 4) Actuators
- 5) Relays/Switches
- 6) Control Panels
- 7) Power Supply
- 8) Batteries
- 9) Operator Interface Equipment
- 10) Wiring
- c. Wiring diagrams and layouts for each control panel. Show all termination numbers.
- d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.
- 2. Central System Hardware and Software:
  - a. A complete bill of material of equipment used, indicating quantity, manufacturer, model number, and other relevant technical data.
  - b. Manufacturer's description and technical data, such as product specification sheets and installation/maintenance instructions for the items listed below and other relevant items not listed below:
    - 1) Central Processing Unit
    - 2) Monitors
    - 3) Keyboard
    - 4) Power Supply
    - 5) Battery Backup
    - 6) Interface Equipment Between CPU and Control Panels
    - 7) Operating System Software
    - 8) Operator Interface Software
    - 9) Color Graphic Software
    - 10) Third-Party Software
  - c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.
  - d. Riser diagrams of wiring between central control unit and all control panels.
  - e. A list of the color graphic screens to be provided. For each screen, provide a conceptual layout of pictures and data and show or explain which other screens can be directly accessed.
- 3. Controlled Systems
  - a. Riser diagrams showing control network layout, communication protocol, and wire types.
  - b. A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
  - c. A schematic wiring diagram for each controlled system. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the control system schematic, it shall be labeled with the same name. All terminals shall be labeled.
  - d. An instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number.
  - e. A mounting, wiring, and routing plan-view drawing. The drawing shall be done in ¼ in. scale. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
  - f. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
  - g. A point list for each system controller including both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, and the location of the I/O device. Software flag points, alarm points, etc.
- 4. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- 5. A description of the proposed process along with all report formats and checklists to be used in Part 3: "Control System Demonstration and Acceptance."
- 6. A BACnet Protocol Implementation Conformance Statement (PICS) for each type of controller and operator interface included in the submittal.
- B. Schedules:
  - 1. Within one month of contract award, provide a schedule of the work indicating the following:
    - a. Intended sequence of work items.
    - b. Start dates of individual work items.
    - c. Duration of individual work items.
    - d. Planned delivery dates for major material and equipment and expected lead times.
    - e. Milestones indicating possible restraints on work by other trades or situations.
  - 2. Provide monthly written status reports indicating work completed, revisions to expected delivery dates, etc. An updated project schedule shall be included.
- C. Project Record Documents: Upon completion of installation, submit three copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and shall include:
  - 1. Project Record Drawings. As-built versions of the submittal shop drawings provided as AutoCAD 2004 (or newer) compatible files on optical media and as 11" x 17" prints.
  - 2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Part 3: "Control System Demonstration and Acceptance."
  - 3. Certification of pressure test required in Part 3: "Control Air Tubing."
  - 4. Operation and Maintenance (O & M) Manual.
  - 5. As-built versions of submittal product data.
  - 6. Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems.
  - 7. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
  - 8. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
  - 9. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
  - 10. Documentation of all programs created using custom programming language including setpoints, tuning parameters, and object database.
  - 11. Graphic files, programs, and database on magnetic or optical media.
  - 12. List of recommended spare parts with part numbers and suppliers.
  - 13. Complete original-issue documentation, installation, and maintenance information for furnished thirdparty hardware including computer equipment and sensors.
  - 14. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
  - 15. Licenses, guarantees, and warranty documents for equipment and systems.
  - 16. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
- D. Training Materials. Provide course outline and manual for each class at least six weeks before first class. Engineer will modify course outlines and manuals if necessary to meet Owner's needs. Engineer will review and approve course outlines and manuals at least three weeks before first class.

## 1.12 WARRANTY

- A. Warrant work as follows:
  - 1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.

- 2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
- 3. If Engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, Engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.
- 4. Provide updates to operator workstation software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.
- 5. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

# 1.13 OWNERSHIP OF PROPRIETARY MATERIAL

- A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
  - 1. Graphics
  - 2. Record drawings
  - 3. Database
  - 4. Application programming code
  - 5. Documentation

# 1.14 DEFINITIONS

Term	Definition
BACnet Interoperability	A BIBB defines a small portion of BACnet functionality that is
Building Blocks (BIBB)	needed to perform a particular task. BIBBS are combined to build
	the BACnet functional requirements for a device in a
	specification.
BACnet/BACnet	BACnet communication requirements as defined by the latest
Standard	version of ASHRAE/ANSI 135 and approved addenda.
Control Systems Server	A computer(s) that maintain(s) the systems configuration and
	programming database.
Controller	Intelligent stand-alone control device. Controller is a generic
	reference to building controllers, custom application controllers,
	and application specific controllers.
Direct Digital Control	Microprocessor-based control including Analog/Digital conversion
	and program logic.
Gateway	Bi-directional protocol translator connecting control systems that
	use different communication protocols.
Local Area Network	Computer or control system communications network limited to
	local building or campus.
Master-Slave/Token	Data link protocol as defined by the BACnet standard.
Passing	
Point-to-Point	Serial communication as defined in the BACnet standard.
Primary Controlling LAN	High speed, peer-to-peer controller LAN connecting BCs and
	optionally AACs and ASCs. Refer to System Architecture below.
Protocol Implementation	A written document that identifies the particular options specified
Conformance Statement	by BACnet that are implemented in a device.
Router	A device that connects two or more networks at the network
	layer.
Wiring	Raceway, fittings, wire, boxes and related items.

### PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 25 installations. Do not use this installation as a product test site. Spare parts shall be available for at least five years after completion of this contract.

### 2.2 COMMUNICATION

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2004, BACnet.
- B. Each controller shall have a communication port for connection to an operator interface.
- C. The existing Automated Logic-brand controller and the existing Automated Logic-brand expander panel for additional inputs and output points shall be reused.

### 2.3 OPERATOR INTERFACE

- A. Operator Interface. PC-based workstation shall reside on high-speed network with building controllers as shown on system drawings. Each workstation or each standard browser connected to server shall be able to access all system information.
- B. Workstation and controllers shall communicate using BACnet protocol. Workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ASHRAE/ANSI 135-2001, BACnet Annex J.
- C. Hardware. The existing personal computer(PC) used as the current operator interface shall be reused.

### 2.4 CONTROLLER SOFTWARE

- A. Furnish the following applications software for building and energy management. All software applications shall reside and operate in the system controllers. Editing of applications shall occur at the operator workstation.
- B. System Security
  - 1. User access shall be secured using individual security passwords and user names.
  - 2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
  - 3. User Log On/Log Off attempts shall be recorded.
  - 4. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.
- C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each schedule shall consist of the following:
  - 1. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. Each schedule may consist of up to 10 events. When a group of objects are scheduled together, provide the capability to adjust the start and stop times for each member.
  - 2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.
  - 3. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
- D. System Coordination. Provide a standard application for the proper coordination of equipment. This application shall provide the operator with a method of grouping together equipment based on function and location. This group may then be used for scheduling and other applications.
- E. Binary Alarms. Each binary object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
- F. Analog Alarms. Each analog object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- G. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the appropriate workstations based on time and other conditions. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display graphics.
- H. Remote Communication. The system shall have the ability to dial out in the event of an alarm using BACnet PTP. Receivers shall be BACnet workstations.
- I. Demand Limiting.
  - 1. The demand-limiting program shall monitor building power consumption from signals generated by a pulse generator (provided by others) mounted at the building power meter or from a watt transducer or current transformer attached to the building feeder lines.
  - 2. The demand-limiting program shall predict the probable power demand such that action can be taken to prevent exceeding the demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined manner. When demand prediction indicates the demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.
  - 3. Demand reduction shall be accomplished by the following means:
    - a. Reset air-handling unit supply temperature set point up by 1°C (2°F).
    - b. Reset space temperature set points up by 1°C (2°F).
    - c. De-energize equipment based upon priority.
  - 4. Demand-limiting parameters, frequency of calculations, time intervals, and other relevant variables shall be based on the means by which the local power company computes demand charges.
  - 5. Provide demand-limiting prediction and control for any individual meter monitored by the system or for the total of any combination of meters.
  - 6. Provide the means for an operator to make the following changes on-line:
    - a. Addition and deletion of loads controlled.
    - b. Changes in demand intervals.
    - c. Changes in demand limit for meter(s).
    - d. Maximum shutoff time for equipment.
    - e. Minimum shutoff time for equipment.
    - f. Select rotational or sequential shedding and restoring.
    - g. Shed/restore priority.
  - 7. Provide the following information and reports, to be available on an hourly, daily, and monthly basis:
    - a. Total electric consumption.
    - b. Peak demand.
    - c. Date and time of peak demand.
    - d. Daily peak demand.
- J. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user-designated run-time, starts, and/or calendar date limits.
- K. Sequencing. Provide application software based upon the sequences of operation specified to properly sequence chillers, boilers, and pumps.
- L. PI Control. A PI (proportional-integral) algorithm with direct or reverse action shall be supplied. The controlled variable, set point, and PI gains shall be user-selectable.
- M. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user-selectable.
- N. Energy Calculations.
  - 1. Provide software to allow instantaneous power (e.g., kW) or flow rates (e.g., L/s [gpm]) to be accumulated and converted to energy usage data.
  - 2. Provide an algorithm that calculates a sliding-window average (e.g., rolling average). The algorithm shall be flexible to allow window intervals to be user specified (e.g., 15 minutes, 30 minutes, 60 minutes).
  - 3. Provide an algorithm that calculates a fixed-window average. A digital input signal will define the start of the window period (e.g., signal from utility meter) to synchronize the fixed-window average with that used by the utility.
- O. Anti-Short Cycling. All binary output objects shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- P. On/Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and set point. The algorithm shall be direct-acting or reverse-acting and incorporate an adjustable differential.
- Q. Run-Time Totalization. Provide software to totalize run-times for all binary input objects. A high run-time alarm shall be assigned, if required, by the operator.
- 2.5 NOT USED
- 2.6 CUSTOM APPLICATION CONTROLLERS
  - A. General. Provide an adequate number of Custom Application Controllers to achieve the performance specified in the Part 1 Article on "System Performance." Each of these panels shall meet the following requirements.
    - 1. The custom application controller shall have sufficient memory to support its operating system, database, and programming requirements.
    - 2. Data shall be shared between networked custom application controllers.
    - 3. The operating system of the controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms.
    - 4. Controllers that perform scheduling shall have a real-time clock.
    - 5. The custom application controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall
      - a. assume a predetermined failure mode and
      - b. generate an alarm notification.
    - 6. The custom application controller shall communicate with other BACnet devices on the internetwork using the Read (Execute and Initiate) and Write (Execute and Initiate) Property services as defined in Clauses 15.5 and 15.9, respectively, of ANSI/ASHRAE Standard 135-2004.
  - B. Communication.
    - 1. Each custom application controller shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.
    - 2. The controller shall provide a service communication port using BACnet Data Link/Physical layer protocol for connection to a portable operator's terminal.
  - C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
    - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at □40°C to 65°C (□40°F to 150°F).
    - 2. Controllers used in conditioned space shall be mounted in dustproof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
  - D. Keypad. A local keypad and display shall be provided. The keypad shall be provided for interrogating and editing data. An optional system security password shall be available to prevent unauthorized use of the keypad and display.
  - E. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
  - F. Memory. The custom application controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
  - G. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

### 2.7 APPLICATION SPECIFIC CONTROLLERS

A. General. Application specific controllers (ASCs) are microprocessor-based DDC controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user-programmable but are customized for operation within the confines of the equipment they are designed to serve. Application specific controllers shall communicate with other BACnet devices on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of ANSI/ASHRAE Standard 135-2004.

- 1. Each ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
- 2. Each ASC will contain sufficient I/O capacity to control the target system.
- B. Communication.
  - 1. The controller shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol. Each network of controllers shall be connected to one building controller.
  - Each controller shall have a BACnet Data Link/Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown.
- C. Environment. The hardware shall be suitable for the anticipated ambient conditions.
  - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at □40°C to 65°C (□40°F to 150°F).
  - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
- E. Memory. The application specific controller shall use nonvolatile memory and maintain all BIOS and programming information in the event of a power loss.
- F. Immunity to power and noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- G. Transformer. Power supply for the ASC must be rated at a minimum of 125% of ASC power consumption and shall be of the fused or current limiting type.

## 2.8 INPUT/OUTPUT INTERFACE

- A. Hardwired inputs and outputs may tie into the system through building, custom application, or application specific controllers.
- B. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no damage to the controller.
- C. Binary inputs shall allow the monitoring of On/Off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
- D. Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects and also accept up to 10 pulses per second for pulse accumulation.
- E. Analog inputs shall allow the monitoring of low-voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with—and field configurable to— commonly available sensing devices.
- F. Binary outputs shall provide for On/Off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have three-position (On/Off/Auto) override switches and status lights. Outputs shall be selectable for either normally open or normally closed operation.
- G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on building or custom application controllers shall have status lights and a two-position (AUTO/MANUAL) switch and manually adjustable potentiometer for manual override. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.
- H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

- I. Input/Output points shall be the universal type, i.e., controller input or output may be designated (in software) as either a binary or analog type point with appropriate properties. Application specific controllers are exempted from this requirement.
- J. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

## 2.9 POWER SUPPLIES AND LINE FILTERING

- A. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in both primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
  - DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand a 150% current overload for at least three seconds without trip-out or failure.
    - a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MIL-STD 810C for shock and vibration.
    - b. Line voltage units shall be UL recognized and CSA approved.
- B. Power line filtering.
  - 1. Provide transient voltage and surge suppression for all workstations and controllers either internally or as an external component. Surge protection shall have the following at a minimum:
    - a. Dielectric strength of 1000 volts minimum
    - b. Response time of 10 nanoseconds or less
    - c. Transverse mode noise attenuation of 65 dB or greater
    - d. Common mode noise attenuation of 150 dB or better at 40 Hz to 100 Hz

## 2.10 AUXILIARY CONTROL DEVICES

- A. Motorized control dampers, unless otherwise specified elsewhere, shall be as follows:
  - 1. Control dampers shall be the parallel or opposed blade type as indicated on the drawings.
  - 2. Damper frames shall be minimum 13-gauge galvanized steel channel or 1/8 in. extruded aluminum with reinforced corner bracing.
  - 3. Damper blades shall not exceed 8 inches in width or 48 inches in length. Blades are to be suitable for medium velocity performance [2,000 fpm]. Blades shall be not less than 16 gauge.
  - 4. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze or better.
  - 5. All blade edges and top and bottom of the frame shall be provided with replaceable butyl rubber or neoprene seals. Side seals shall be spring-loaded stainless steel. The blade seals shall provide for a maximum leakage rate of 10 cfm per square foot at 4 in. w.g. differential pressure. Provide airfoil blades suitable for a wide-open face velocity of 1,500 fpm.
  - 6. Individual damper sections shall not be larger than 48 inches × 60 inches. Provide a minimum of one damper actuator per section.
  - 7. Modulating dampers shall provide a linear flow characteristic where possible.
  - 8. Dampers shall have exposed linkages.
- B. Electric damper/valve actuators.
  - 1. The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.
  - 2. Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing. Alternatively, an uninterruptible power supply (UPS) may be provided.
  - 3. Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range.
  - 4. All 24 VAC/VDC actuators shall operate on Class 2 wiring as defined in the National Electrical Code.

- 5. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 60 in.-lb. torque capacity shall have a manual crank for this purpose.
- C. Temperature sensors.
  - 1. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
  - Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m<sup>2</sup> (10 ft<sup>2</sup>) of duct cross section.
  - 3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the flow velocities in the pipe.
  - 4. Space sensors shall be equipped with set point adjustment, override switch, display, and/or communication port as shown.
  - 5. Provide matched temperature sensors for differential temperature measurement.

# D. Humidity sensors.

- 1. Duct and room sensors shall have a sensing range of 20% to 80%.
- 2. Duct sensors shall be provided with a sampling chamber.
- 3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of □40°C to 75°C (□40°F to 170°F).
- 4. Humidity sensor's drift shall not exceed 1% of full scale per year.
- E. Flow switches.
  - 1. Flow-proving switches shall be either paddle or differential pressure type, as shown.
  - Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum) and shall have adjustable sensitivity with NEMA 1 enclosure unless otherwise specified.
  - 3. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application or as specified.
- F. Relays.
  - 1. Control relays shall be UL listed plug-in type with dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
  - Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable ±200% (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.
- G. Override timers.
  - 1. Override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration as required by application. Provide 0-to-6-hour calibrated dial unless otherwise specified. Timer shall be suitable for flush mounting on control panel face and located on local control panels or where shown.
- H. Current transmitters.
  - AC current transmitters shall be the self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, with internal zero and span adjustment and ±1% full-scale accuracy at 500 ohm maximum burden.
  - 2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA Recognized.
  - 3. Unit shall be split-core type for clamp-on installation on existing wiring.
- I. Current transformers.
  - 1. AC current transformers shall be UL/CSA Recognized and completely encased (except for terminals) in approved plastic material.
  - 2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.
  - 3. Transformers shall be fixed-core or split-core type for installation on new or existing wiring, respectively.
- J. Voltage transmitters.

- 1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.
- 2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC fullscale, adjustable, with ±1% full-scale accuracy with 500 ohm maximum burden.
- 3. Transmitters shall be UL/CSA Recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.
- K. Voltage transformers.
  - 1. AC voltage transformers shall be UL/CSA Recognized, 600 VAC rated, complete with built-in fuse protection.
  - 2. Transformers shall be suitable for ambient temperatures of 4°C to 55°C (40°F to 130°F) and shall provide ±0.5% accuracy at 24 VAC and a 5 VA load.
  - 3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.

# L. Power Monitors

- 1. Selectable rate pulse output for kWh reading, 4–20 mA output for kW reading, N.O. alarm contact, and ability to operate with 5.0 amp current inputs or 0–0.33 volt inputs.
- 2. 1.0% full-scale true RMS power accuracy, + 0.5 Hz, voltage input range 120–600 V, and auto range select.
- 3. Under voltage/phase monitor circuitry.
- 4. NEMA 1 enclosure.
- 5. Current transformers having a 0.5% FS accuracy, 600 VAC isolation voltage with 0–0.33 V output. If 0–5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.
- M. Thermal Energy Meters
  - 1. Matched  $\widetilde{RTD}$  or thermistor temperature sensors with a differential temperature accuracy of ±0.15°F.
  - 2. Flow meter that is accurate within ±1% at calibrated typical flow rate and does not exceed ±2% of actual reading over an extended 50:1 turndown range.
  - 3. Unit accuracy of  $\pm 1\%$  factory calibrated, traceable to NIST with certification.
  - 4. NEMA 1 enclosure.
  - 5. Panel mounted display.
  - 6. UL listed.
  - 7. Isolated 4–20 ma signals for energy rate and supply and return temperatures and flow.
- N. Current switches.
  - 1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.
- O. Pressure transducers.
  - 1. Transducer shall have linear output signal. Zero and span shall be field adjustable.
  - 2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.
  - 3. Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and block and bleed valves.
  - 4. Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (differential pressure) and maximum static pressure shall be 300 psi. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and five-valve manifold.
- P. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application or as shown.
- Q. Pressure-Electric (PE) Switches.
  - 1. Shall be metal or neoprene diaphragm actuated, operating pressure rated 0-175 kPa (0-25 psig), with calibrated scale setpoint range of 14-125 kPa (2-18 psig) minimum, UL listed.
  - 2. Provide one- or two-stage switch action SPDT, DPST, or DPDT, as required by application. Electrically rated for pilot duty service (125 VA minimum) and/or for motor control.
  - 3. Shall be open type (panel-mounted) or enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- 4. Shall have a permanent indicating gauge on each pneumatic signal line to PE switches.
- R. Electro-pneumatic (E/P) transducers.
  - 1. Electronic/pneumatic transducer shall provide a proportional 20 to 100 kPa (3 to 15 psig) output signal from either a 4 to 20 mA or 0 to 10 VDC analog control input.
  - 2. E/P transducer shall be equipped with the following features:
    - a. Separate span and zero adjustments
    - b. Manual output adjustments
    - c. Pressure gauge assembly
    - d. Feedback loop control
    - e. Air consumption of 0.05 L/s (0.1 scfm) at mid-range
- S. Local control panels.
  - 1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable subpanels. A single key shall be common to all field panels and subpanels.
  - 2. Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
  - 3. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.
- 2.11 WIRING AND RACEWAYS
  - A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 16.
  - B. All insulated wire to be copper conductors, UL labeled for 90°C minimum service.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.
- B. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.
- C. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the contractor to report such discrepancies shall be made by—and at the expense of—this contractor.

#### 3.2 PROTECTION

- A. The contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.
- B. The contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The contractor shall protect any material that is not immediately installed. The contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

#### 3.3 COORDINATION

A. Site

1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.

- 2. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.
- B. Submittals. Refer to the "Submittals" article in Part 1 of this specification for requirements.
- C. Test and Balance
  - 1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
  - 2. The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.
  - 3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
  - 4. The tools used during the test and balance process will be returned at the completion of the testing and balancing.
- D. Life Safety
  - 1. Duct smoke detectors required for air handler shutdown are supplied under Division 16 of this specification. The contractor shall interlock smoke detectors to air handlers for shutdown as described in Part 3, "Sequences of Operation."
  - Smoke dampers and actuators required for duct smoke isolation are provided under a Section of Division 15. The contractor shall interlock these dampers to the air handlers as described in Part 3, "Sequences of Operation."
  - 3. Fire/smoke dampers and actuators required for fire rated walls are provided under another Section of Division 15. Control of these dampers shall be by Division 16. The contractor shall provide control air to the dampers.
- E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
  - 1. All communication media and equipment shall be provided as specified in Part 2, "Communication" of this specification.
  - 2. Each supplier of a controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.
  - 3. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.
  - 4. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
  - 5. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

## 3.4 GENERAL WORKMANSHIP

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

## 3.5 FIELD QUALITY CONTROL

- A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this specification.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

C. Contractor shall have work inspected by local and/ or state authorities having jurisdiction over the work.

## 3.6 EXISTING EQUIPMENT

- A. Wiring: The contractor may not reuse abandoned wiring from the past.
- B. Local Control Panels: {The contractor may reuse any existing local control panel to locate new equipment. All redundant equipment within these panels must be removed. Panel face cover must be patched to fill all holes caused by removal of unused equipment or replaced with new.} {Remove and deliver to owner.} {Existing panels become the property of the contractor.} {Salvage, recondition, and reuse existing devices and cabinets as noted. Relocate as shown.}
- C. Unless otherwise directed, the contractor is not responsible for the repairs or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the contractor find existing equipment that requires maintenance, the engineer is to be notified immediately.
- D. Temperature Sensor Wells: The contractor may reuse any existing wells in piping for temperature sensors. These wells shall be modified as required for proper fit of new sensors.
- E. Indicator Gauges: Where these devices remain and are not removed, they must be made operational and recalibrated to ensure reasonable accuracy. Maintain the operation of existing pneumatic transmitters and gauges.
- F. Room Thermostats: {Salvage, recondition, and reuse} {Deliver to Owner} {Shall be removed and become the property of the contractor, unless otherwise noted}.
- G. Electronic Sensors and Transmitters: Unless specifically noted otherwise, {remove and deliver to the Owner} {become the property of the contractor}.
- H. Controllers and Auxiliary Electronic Devices: {Deliver to the owner} {Salvage, recondition, and reuse} {Become the property of the contractor}.
- I. Pneumatic Controllers, Relays and Gauges: {Deliver to owner} {Become the property of the contractor}.
- J. Damper Actuators, Linkages, and Appurtenances: {Deliver to owner} {Salvage, recondition, and reuse} {Become the property of the contractor}.
- K. Control Valves: {Replace with new} {Salvage, recondition, and reuse} {Become the property of the contractor}.
- L. Control Compressed Air System: {Deliver to owner and replace with new system} {Salvage, recondition, and reuse} {Becomes the property of the contractor, unless otherwise noted}.
- M. The mechanical system must remain in operation between the hours of 6 a.m. and 6 p.m., Monday through Friday. No modifications to the system shall cause the mechanical system to be shut down for more than 15 minutes or to fail to maintain space comfort conditions during any such period. Perform cut-over of controls that cannot meet these conditions outside of those hours.
- N. The scheduling of fans through existing or temporary time clocks or control system shall be maintained throughout the DDC system installation.
- O. Install control panels where shown.
- P. Modify existing starter control circuits, if necessary, to provide hand/off/auto control of each starter controlled. If new starters or starter control packages are required, these shall be included as part of this contract.
- Q. Patch holes and finish to match existing walls.

# 3.7 WIRING

- A. All control and interlock wiring shall comply with national and local electrical codes and Division 16 of this specification. Where the requirements of this section differ from those in Division 16, the requirements of this section shall take precedence.
- B. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway according to NEC and Division 16 requirements.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be subfused when required to meet Class 2 current limit.)
- D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenums shall be UL Listed specifically for that purpose.
- E. All wiring in mechanical, electrical, or service rooms—or where subject to mechanical damage— shall be installed in raceway at levels below 3 m (10 ft).

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- F. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing highvoltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
- G. Do not install wiring in raceway containing tubing.
- H. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.
- I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.
- J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.
- K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.
- M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.
- N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.
- O. Size of raceway and size and type of wire shall be the responsibility of the contractor, in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.
- P. Include one pull string in each raceway 2.5 cm (1 in.) or larger.
- Q. Use coded conductors throughout with conductors of different colors.
- R. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.
- S. Conceal all raceways, except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g., steam pipes or flues).
- T. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.
- U. Adhere to this specification's Division 16 requirements where raceway crosses building expansion joints.
- V. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all vertical raceways.
- W. The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- X. Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.
- Y. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

#### 3.8 COMMUNICATION WIRING

- A. The contractor shall adhere to the items listed in the Wiring" article in Part 3 of the specification.
- B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.
- C. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
- D. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
- E. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.
- F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to the manufacturer's instructions.
- G. All runs of communication wiring shall be unspliced length when that length is commercially available.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- H. All communication wiring shall be labeled to indicate origination and destination data.
- I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

### 3.9 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequately for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
- D. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.
- F. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m of sensing element for each 1 m2 (1 ft of sensing element for each 1 ft2) of coil area.
- G. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.
- H. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.
- I. Differential air static pressure.
  - 1. Supply Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the lowpressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.
  - 2. Return Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the lowpressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.
  - 3. Building Static Pressure: Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
  - 4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
  - 5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
  - 6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shutoff valves installed before the tee.

#### 3.10 FLOW SWITCH INSTALLATION

- A. Use correct paddle for pipe diameter.
- B. Adjust flow switch in accordance with manufacturer's instructions.

## 3.11 ACTUATORS

- A. Mount and link control damper actuators according to manufacturer's instructions.
  - 1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
  - 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
  - 3. Provide all mounting hardware and linkages for actuator installation.
- B. Electric/Electronic
  - 1. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.
  - 2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

#### C. Pneumatic Actuators

- 1. Size pneumatic damper actuator to operate the related control damper(s) with sufficient reserve power to provide smooth modulating action or two-position action. Actuator also shall be sized for proper speed of response at the velocity and pressure conditions to which the control damper is subject.
- 2. Pneumatic damper actuators shall produce sufficient torque to close off against the maximum system pressures encountered. Size the pneumatic damper actuator to close off against the fan shutoff pressure, as a minimum.
- 3. Where two or more pneumatic damper actuators are installed for interrelated operation in unison, such as dampers used for mixing, provide the dampers with a positive pilot positioner. The positive pilot positioner shall be directly mounted to the pneumatic damper actuator and have pressure gauges for supply input and output pressures.
- 4. The total damper area operated by an actuator shall not exceed 80% of the manufacturer's maximum area rating. Provide at least one actuator for each damper section. Each damper actuator shall not power more than 2 m2 (20 ft2) of damper.
- 5. Use line shafting or shaft couplings (jackshafting) in lieu of blade-to-blade linkages or shaft coupling when driving axially aligned damper sections.

### 3.12 WARNING LABELS

- A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the DDC system.
  - 1. Labels shall use white lettering (12-point type or larger) on a red background.
  - 2. Warning labels shall read as follows:



- B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.
  - 1. Labels shall use white lettering (12-point type or larger) on a red background.
  - 2. Warning labels shall read as follows:



## 3.13 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 5 cm (2 in.) of termination with the DDC address or termination number.
- B. All pneumatic tubing shall be labeled at each end within 5 cm (2 in.) of termination with a descriptive identifier.
- C. Permanently label or code each point of field terminal strips to show the instrument or item served.
- D. Identify control panels with minimum 1 cm (1/2 in.) letters on laminated plastic nameplates.
- E. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.
- F. Identify room sensors relating to terminal box or valves with nameplates.
- G. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.
- H. Identifiers shall match record documents.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

### 3.14 CONTROLLERS

- A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.
- B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used.
  - 1. Future use of spare capacity shall require providing the field device, field wiring, point database definition, and custom software. No additional controller boards or point modules shall be required to implement use of these spare points.

### 3.15 PROGRAMMING

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free for future use.
- B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index. Use the following naming convention: AA.BBB.CCDDE where
  - 1. AA is used to designate the location of the point within the building, such as mechanical room, wing, or level, or the building itself in a multi-building environment,
  - 2. BBB is used to designate the mechanical system with which the point is associated (e.g., A01, HTG, CLG, LTG),
  - 3. CC represents the equipment or material referenced (e.g., SF for supply fan, RW for return water, EA for exhaust air, ZN for zone),
  - 4. D or DD may be used for clarification or for identification if more than one CC exists (e.g., SF10, ZNB),
  - 5. E represents the action or state of the equipment or medium (e.g., T for temperature, H for humidity, C for control, S for status, D for damper control, I for current).

### C. Software Programming

1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the contractor. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:

#### a. Text-based:

- 1) Must provide actions for all possible situations
- 2) Must be modular and structured
- 3) Must be commented
- b. Graphic-based:
  - 1) Must provide actions for all possible situations
  - 2) Must be documented
- c. Parameter-based:
  - 1) Must provide actions for all possible situations
  - 2) Must be documented
- D. Operator Interface
  - 1. Standard graphics—Provide graphics for all mechanical systems and floor plans of the building. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as set points.
  - 2. Show terminal equipment information on a "graphic" summary table. Provide dynamic information for each point shown.
  - 3. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

## 3.16 CONTROL SYSTEM CHECKOUT AND TESTING

- A. Start-up Testing: All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner's representative is notified of the system demonstration.
  - 1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
  - 2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
  - 3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers' recommendations.
  - 4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
  - 5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
  - Verify that the system operation adheres to the sequences of operation. Simulate and observe all
    modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum
    start/stop routines.
  - 7. Alarms and Interlocks:
    - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the failsafe condition for all actuators is in the proper direction.
    - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

## 3.17 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

## A. Demonstration

- 1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
- 2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" article in Part 3 of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
- 3. The demonstration process shall follow that approved in Part 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
- 4. The contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.
- 5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
- 6. Demonstrate compliance with Part 1, "System Performance."
- 7. Demonstrate compliance with sequences of operation through all modes of operation.
- 8. Demonstrate complete operation of operator interface.
- 9. Additionally, the following items shall be demonstrated:
  - a. DDC loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled

Birmingham Pump Station Screen Replacement Kansas City, Missouri

variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.

- b. Demand limiting. The contractor shall supply a trend data output showing the action of the demand limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.
- c. Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of-value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
- d. Interface to the building fire alarm system.
- e. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.
- 10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.
- B. Acceptance
  - All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.
  - 2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, "Submittals."

# 3.18 CLEANING

- A. The contractor shall clean up all debris resulting from his/her activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
- B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
- C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

## 3.19 TRAINING

- A. Provide a minimum of four on-site or classroom training sessions, three days each, throughout the contract period for personnel designated by the owner.
- B. Provide two additional training sessions at 6 and 12 months following building's turnover. Each session shall be three days in length and must be coordinated with the building owner.
- C. Train the designated staff of owner's representative and owner to enable them to do the following:
  - 1. Day-to-day Operators:
    - a. Proficiently operate the system
    - b. Understand control system architecture and configuration
    - c. Understand DDC system components
    - d. Understand system operation, including DDC system control and optimizing routines (algorithms)
    - e. Operate the workstation and peripherals
    - f. Log on and off the system
    - g. Access graphics, point reports, and logs
    - h. Adjust and change system set points, time schedules, and holiday schedules
    - i. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
    - j. Understand system drawings and Operation and Maintenance manual
    - k. Understand the job layout and location of control components

Birmingham Pump Station Screen Replacement Kansas City, Missouri

Direct Digital Control System

- I. Access data from DDC controllers and ASCs
- m. Operate portable operator's terminals
- 2. Advanced Operators:
  - a. Make and change graphics on the workstation
  - b. Create, delete, and modify alarms, including annunciation and routing of these
  - c. Create, delete, and modify point trend logs and graph or print these both on an ad-hoc basis and at user-definable time intervals
  - d. Create, delete, and modify reports
  - e. Add, remove, and modify system's physical points
  - f. Create, modify, and delete programming
  - g. Add panels when required
  - h. Add operator interface stations
  - i. Create, delete, and modify system displays, both graphical and others
  - j. Perform DDC system field checkout procedures
  - k. Perform DDC controller unit operation and maintenance procedures
  - I. Perform workstation and peripheral operation and maintenance procedures
  - m. Perform DDC system diagnostic procedures
  - n. Configure hardware including PC boards, switches, communication, and I/O points
  - o. Maintain, calibrate, troubleshoot, diagnose, and repair hardware
  - p. Adjust, calibrate, and replace system components
- 3. System Managers/Administrators:
  - a. Maintain software and prepare backups
  - b. Interface with job-specific, third-party operator software
  - c. Add new users and understand password security procedures
- D. These objectives will be divided into three logical groupings. Participants may attend one or more of these, depending on level of knowledge required.
  - 1. Day-to-day Operators: parts 1-13
  - 2. Advanced Operators: parts 1-29
  - 3. System Managers/Administrators: parts 1-13 and 30-32
- E. Provide course outline and materials in accordance with the "Submittals" article in Part 1 of this specification. The instructor(s) shall provide one copy of training material per student.
- F. The instructor(s) shall be factory-trained instructors experienced in presenting this material.
- G. Classroom training shall be done using a network of working controllers representative of the installed hardware.
- 3.20 SEQUENCES OF OPERATION
  - A. [Provide operation as shown on drawings].

#### 3.21 CONTROL DAMPER INSTALLATION

- A. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
- B. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure ¼ in. larger than damper dimensions and shall be square, straight, and level.
- C. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm (1/8 in.) of each other.
- D. Follow the manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- E. Install extended shaft or jackshaft according to manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- F. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- G. Provide a visible and accessible indication of damper position on the drive shaft end.
- H. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- I. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

#### 3.22 DUCT SMOKE DETECTION

- A. Submit data for coordination of duct smoke detector interface to HVAC systems as required in Part 1, "Submittals."
- B. This Contractor shall provide a dry-contact alarm output in the same room as the HVAC equipment to be controlled.

### 3.23 CONTROLS COMMUNICATION PROTOCOL

- A. General. The electronic controls packaged with this equipment shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these controls to read the information and change the control set points as shown in the points list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ANSI/ASHRAE Standard 135-2004 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of Standard 135-2004.
- B. Distributed Processing. The controller shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
- C. I/O Capacity. The controller shall contain sufficient I/ O capacity to control the target system.
- D. Communication. The controller shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol. Each network of controllers shall be connected to one building controller.
- E. The Controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool.
- F. Environment. The hardware shall be suitable for the anticipated ambient conditions.
  - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at □40°C to 65°C (□40°F to 150°F).
  - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- G. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
- H. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.
- I. Immunity to Power and Noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- J. Transformer. Power supply for the Controller must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

## 3.24 START-UP AND CHECKOUT PROCEDURES

- A. Start up, check out, and test all hardware and software and verify communication between all components.
  - 1. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
  - 2. Verify that all analog and binary input/output points read properly.
  - 3. Verify alarms and interlocks.
  - 4. Verify operation of the integrated system.

END OF SECTION

# SECTION 15926

# DIRECT DIGITAL CONTROL SYSTEM – OUTDOOR AIR VENTILATION EQUIPMENT

# PART 1 - GENERAL

- 1.1 SUMMARY OF WORK
  - A. A new direct digital control (DDC) system operating with the BACnet and MS/TP protocols shall control the operation of four (4) new 100% outdoor air makeup air units(each equipped with direct-fired heating capability), two(2) existing 100% outdoor air makeup air units(each equipped with direct-fired heating capability), three(3) new roof-mounted exhaust fans, three(3) existing roof-mounted exhaust fans and one(1) indoor, floor-mounted centrifugal exhaust fan. The DDC control system shall reuse the existing Automated Logic-brand main building controller and the existing I/O expander panel and continue to provide stand-alone control over the new makeup air units, two existing makeup air units to be reused, new roof-mounted exhaust fans and existing exhaust fans to be reused. A second expander panel will need to be added only to accommodate additional input and output points. The DDC control system shall be interconnected with and able to report real-time data and alarms/alarm status back to the existing, main Allen-Bradley PLC panel controlling the overall wastewater pump station and make that data available to the plant operator using graphic display screens on the existing Allen-Bradley PLC system interface.
- 1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION
  - A. Automatic Airflow Volume Control Dampers
  - B. Manual Airflow Dampers
  - C. Turning Vanes
  - D. Duct-Mounted Access Doors
  - E. Flexible Connectors
- 1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION A. None.
- 1.4 PRODUCTS NOT FURNISHED OR INSTALLED UNDER THIS SECTION BUT INTEGRATED WITH THE WORK OF THIS SECTION
  - A. Section 15835 Exhaust Fans
     1. Roof-Mounted Exhaust Fans
  - B. Section 15723 Packaged, Outdoor Makeup Air Units
    - 1. 100% Outdoor Air (OA) Makeup Air Units
- 1.5 RELATED SECTIONS
  - A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents.
  - B. The following sections include related work:
    - 1. Section 15810 Sheet Metal Ductwork
    - 2. Section 15835 Exhaust Fans
    - 3. Section 15723 Packaged, Outdoor Makeup Air Units
- 1.6 DESCRIPTION
  - A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and an operator workstation. The operator workstation shall provide for overall system supervision and configuration, graphical user interface, management report generation, and alarm annunciation.

#### 1.7 APPROVED CONTROL SYSTEM PRIMARY MANUFACTURERS

- A. The following are approved control system manufacturers and product lines:
  - 1. Automated Logic Corporation Carrier Global Corporation
  - 2. Honeywell Building Technologies
  - 3. Trane Technologies, Inc.

Note:

- 1. The order of the above list of manufacturers does not indicate preference. Inclusion on this list does not guarantee acceptance of products or installation. Control systems shall comply with the terms of this specification.
- 2. Use operator workstation software, controller software, custom application programming language, building controllers, custom application controllers, and application specific controllers only from one of the manufacturers and product lines listed.
- 3. Other products specified herein (such as sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

### 1.8 QUALITY ASSURANCE

A. Installer and Manufacturer Qualifications

- 1. Installer shall have an established working relationship with Control System Manufacturer of not less than three years.
- 2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present certification of completed training including hours of instruction and course outlines.

### 1.9 CODES AND STANDARDS

A. Work, materials, and equipment shall comply with the following:

- 1. National Electrical Code
- 2. International Building Code
- 3. International Mechanical Code
- 4. ASHRAE/ANSI 135-2001: Data Communication Protocol for Building Automation and Control systems (BACnet)

### 1.10 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections:

- 1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 seconds.
- 2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 seconds.
- 3. Object Command. Devices shall react to command of a binary object within 2 seconds. Devices shall begin reacting to command of an analog object within 2 seconds.
- 4. Object Scan. Data used or displayed at a controller or workstation shall have been current within the previous 6 seconds.
- 5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 seconds.
- 6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. Select execution times consistent with the mechanical process under control.
- 7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per second. Select execution times consistent with the mechanical process under control.
- 8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 seconds of other workstations.
- 9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
- 10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

I ABLE 1 Reporting Accuracy			
Measured Variable	Reported Accuracy		
Space Temperature	±0.5°C (±1°F)		
Ducted Air	±0.5°C (±1°F)		
Outside Air	±1.0°C (±2°F)		
Dew Point	±1.5°C (±3°F)		
Water Temperature	±0.5°C (±1°F)		
Delta-T	±0.15° (±0.25°F)		

Birmingham Pump Station Screen Replacement Kansas City, Missouri

Measured Variable	Reported Accuracy
Relative Humidity	±5% RH
Water Flow	$\pm 2\%$ of full scale
Airflow (terminal)	$\pm 10\%$ of full scale (see Note 1)
Airflow (measuring stations)	$\pm 5\%$ of full scale
Airflow (pressurized spaces)	$\pm 3\%$ of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	$\pm 2\%$ of full scale (see Note 2)
Electrical	$\pm 1\%$ of reading (see Note 3)
(A, V, W, Power Factor)	
Carbon Monoxide (CO)	$\pm 5\%$ of reading
Carbon Dioxide (CO <sub>2</sub> )	±50 ppm

Note 1: Accuracy applies to 10%–100% of scale Note 2: For both absolute and differential pressure Note 3: Not including utility-supplied meters

TABLE 2Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±0.2 in. w.g.	0–6 in. w.g.
	±0.01 in. w.g.	-0.1 to 0.1 in. w.g.
Airflow	$\pm 10\%$ of full scale	
Space Temperature	±2.0°F	
Duct Temperature	±3°F	
Humidity	±5% RH	
Fluid Pressure	±1.5 psi	1–150 psi
	±1.0 in. w.g.	0–50 in. w.g. differential

#### 1.11 SUBMITTALS

- A. Product Data and Shop Drawings: Contractor shall provide shop drawings or other submittals on all hardware, software, and installation to be provided. No work may begin on any segment of this project until submittals have been successfully reviewed for conformity with the design intent. Six copies are required. Provide drawings as AutoCAD 2004 (or newer) compatible files on optical disk (file format: .dwg, .dxf, .vsd, or comparable) with three 11" x 17" prints of each drawing. When manufacturer's cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:
  - 1. Direct Digital Control System Hardware:
    - a. A complete bill of materials of equipment to be used indicating quantity, manufacturer, model number, and other relevant technical data.
    - b. Manufacturer's description and technical data, such as performance curves, product specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:
      - 1) Direct Digital Controller (controller panels)
      - 2) Transducers/Transmitters
      - 3) Sensors (including accuracy data)
      - 4) Actuators
      - 5) Relays/Switches
      - 6) Control Panels

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- 7) Power Supply
- 8) Batteries
- 9) Operator Interface Equipment
- 10) Wiring
- c. Wiring diagrams and layouts for each control panel. Show all termination numbers.
- d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.
- 2. Central System Hardware and Software:
  - a. A complete bill of material of equipment used, indicating quantity, manufacturer, model number, and other relevant technical data.
  - b. Manufacturer's description and technical data, such as product specification sheets and installation/maintenance instructions for the items listed below and other relevant items not listed below:
    - 1) Central Processing Unit
    - 2) Monitors
    - 3) Keyboard
    - 4) Power Supply
    - 5) Battery Backup
    - 6) Interface Equipment Between CPU and Control Panels
    - 7) Operating System Software
    - 8) Operator Interface Software
    - 9) Color Graphic Software
    - 10) Third-Party Software
  - c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.
  - d. Riser diagrams of wiring between central control unit and all control panels.
  - e. A list of the color graphic screens to be provided. For each screen, provide a conceptual layout of pictures and data and show or explain which other screens can be directly accessed.
- 3. Controlled Systems
  - a. Riser diagrams showing control network layout, communication protocol, and wire types.
  - b. A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
  - c. A schematic wiring diagram for each controlled system. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the control system schematic, it shall be labeled with the same name. All terminals shall be labeled.
  - d. An instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number.
  - e. A mounting, wiring, and routing plan-view drawing. The drawing shall be done in ¼ in. scale. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
  - f. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
  - g. A point list for each system controller including both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, and the location of the I/O device. Software flag points, alarm points, etc.
- 4. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.
- 5. A description of the proposed process along with all report formats and checklists to be used in Part 3: "Control System Demonstration and Acceptance."
- 6. A BACnet Protocol Implementation Conformance Statement (PICS) for each type of controller and operator interface included in the submittal.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

### B. Schedules:

- 1. Within one month of contract award, provide a schedule of the work indicating the following:
  - a. Intended sequence of work items.
  - b. Start dates of individual work items.
  - c. Duration of individual work items.
  - d. Planned delivery dates for major material and equipment and expected lead times.
  - e. Milestones indicating possible restraints on work by other trades or situations.
- 2. Provide monthly written status reports indicating work completed, revisions to expected delivery dates, etc. An updated project schedule shall be included.
- C. Project Record Documents: Upon completion of installation, submit three copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and shall include:
  - 1. Project Record Drawings. As-built versions of the submittal shop drawings provided as AutoCAD 2004 (or newer) compatible files on optical media and as 11" x 17" prints.
  - 2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Part 3: "Control System Demonstration and Acceptance."
  - 3. Certification of pressure test required in Part 3: "Control Air Tubing."
  - 4. Operation and Maintenance (O & M) Manual.
  - 5. As-built versions of submittal product data.
  - 6. Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems.
  - 7. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
  - 8. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
  - 9. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
  - 10. Documentation of all programs created using custom programming language including setpoints, tuning parameters, and object database.
  - 11. Graphic files, programs, and database on magnetic or optical media.
  - 12. List of recommended spare parts with part numbers and suppliers.
  - 13. Complete original-issue documentation, installation, and maintenance information for furnished thirdparty hardware including computer equipment and sensors.
  - 14. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
  - 15. Licenses, guarantees, and warranty documents for equipment and systems.
  - 16. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
- D. Training Materials. Provide course outline and manual for each class at least six weeks before first class. Engineer will modify course outlines and manuals if necessary to meet Owner's needs. Engineer will review and approve course outlines and manuals at least three weeks before first class.

# 1.12 WARRANTY

- A. Warrant work as follows:
  - 1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.
  - 2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
  - 3. If Engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, Engineer will certify in writing that control system operation has

Birmingham Pump Station Screen Replacement Kansas City, Missouri

been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.

- 4. Provide updates to operator workstation software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.
- 5. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

## 1.13 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:

- 1. Graphics
- 2. Record drawings
- 3. Database
- 4. Application programming code
- 5. Documentation

#### 1.14 DEFINITIONS

Term	Definition
BACnet Interoperability	A BIBB defines a small portion of BACnet functionality that is
Building Blocks (BIBB)	needed to perform a particular task. BIBBS are combined to build
	the BACnet functional requirements for a device in a
	specification.
BACnet/BACnet	BACnet communication requirements as defined by the latest
Standard	version of ASHRAE/ANSI 135 and approved addenda.
Control Systems Server	A computer(s) that maintain(s) the systems configuration and
	programming database.
Controller	Intelligent stand-alone control device. Controller is a generic
	reference to building controllers, custom application controllers,
	and application specific controllers.
Direct Digital Control	Microprocessor-based control including Analog/Digital conversion
	and program logic.
Gateway	Bi-directional protocol translator connecting control systems that
	use different communication protocols.
Local Area Network	Computer or control system communications network limited to
	local building or campus.
Master-Slave/Token	Data link protocol as defined by the BACnet standard.
Passing	
Point-to-Point	Serial communication as defined in the BACnet standard.
Primary Controlling LAN	High speed, peer-to-peer controller LAN connecting BCs and
	optionally AACs and ASCs. Refer to System Architecture below.
Protocol Implementation	A written document that identifies the particular options specified
Conformance Statement	by BACnet that are implemented in a device.
Router	A device that connects two or more networks at the network
	layer.
Wiring	Raceway, fittings, wire, boxes and related items.

### PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 25 installations. Do not use this installation as a product test site. Spare parts shall be available for at least five years after completion of this contract.

### 2.2 COMMUNICATION

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2004, BACnet.
- B. Each controller shall have a communication port for connection to an operator interface.
- C. The existing Automated Logic-brand controller and the existing Automated Logic-brand expander panel for additional inputs and output points shall be reused.

### 2.3 OPERATOR INTERFACE

- A. Operator Interface. PC-based workstation shall reside on high-speed network with building controllers as shown on system drawings. Each workstation or each standard browser connected to server shall be able to access all system information.
- B. Workstation and controllers shall communicate using BACnet protocol. Workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ASHRAE/ANSI 135-2001, BACnet Annex J.
- C. Hardware. The existing personal computer (PC) used as the current operator interface shall be reused.

## 2.4 CONTROLLER SOFTWARE

- A. Furnish the following applications software for building and energy management. All software applications shall reside and operate in the system controllers. Editing of applications shall occur at the operator workstation.
- B. System Security
  - 1. User access shall be secured using individual security passwords and user names.
  - 2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
  - 3. User Log On/Log Off attempts shall be recorded.
  - 4. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.
- C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each schedule shall consist of the following:
  - 1. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. Each schedule may consist of up to 10 events. When a group of objects are scheduled together, provide the capability to adjust the start and stop times for each member.
  - 2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.
  - 3. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
- D. System Coordination. Provide a standard application for the proper coordination of equipment. This application shall provide the operator with a method of grouping together equipment based on function and location. This group may then be used for scheduling and other applications.
- E. Binary Alarms. Each binary object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
- F. Analog Alarms. Each analog object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.

Birmingham Pump Station Screen Replacement Kansas City, Missouri
- G. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the appropriate workstations based on time and other conditions. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display graphics.
- H. Remote Communication. The system shall have the ability to dial out in the event of an alarm using BACnet PTP. Receivers shall be BACnet workstations.
- I. Demand Limiting.
  - 1. The demand-limiting program shall monitor building power consumption from signals generated by a pulse generator (provided by others) mounted at the building power meter or from a watt transducer or current transformer attached to the building feeder lines.
  - 2. The demand-limiting program shall predict the probable power demand such that action can be taken to prevent exceeding the demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined manner. When demand prediction indicates the demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.
  - 3. Demand reduction shall be accomplished by the following means:
    - a. Reset air-handling unit supply temperature set point up by 1°C (2°F).
    - b. Reset space temperature set points up by 1°C (2°F).
    - c. De-energize equipment based upon priority.
  - 4. Demand-limiting parameters, frequency of calculations, time intervals, and other relevant variables shall be based on the means by which the local power company computes demand charges.
  - 5. Provide demand-limiting prediction and control for any individual meter monitored by the system or for the total of any combination of meters.
  - 6. Provide the means for an operator to make the following changes on-line:
    - a. Addition and deletion of loads controlled.
    - b. Changes in demand intervals.
    - c. Changes in demand limit for meter(s).
    - d. Maximum shutoff time for equipment.
    - e. Minimum shutoff time for equipment.
    - f. Select rotational or sequential shedding and restoring.
    - g. Shed/restore priority.
  - 7. Provide the following information and reports, to be available on an hourly, daily, and monthly basis:
    - a. Total electric consumption.
    - b. Peak demand.
    - c. Date and time of peak demand.
    - d. Daily peak demand.
- J. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user-designated run-time, starts, and/or calendar date limits.
- K. Sequencing. Provide application software based upon the sequences of operation specified to properly sequence chillers, boilers, and pumps.
- L. PI Control. A PI (proportional-integral) algorithm with direct or reverse action shall be supplied. The controlled variable, set point, and PI gains shall be user-selectable.
- M. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user-selectable.
- N. Energy Calculations.
  - 1. Provide software to allow instantaneous power (e.g., kW) or flow rates (e.g., L/s [gpm]) to be accumulated and converted to energy usage data.
  - 2. Provide an algorithm that calculates a sliding-window average (e.g., rolling average). The algorithm shall be flexible to allow window intervals to be user specified (e.g., 15 minutes, 30 minutes, 60 minutes).
  - 3. Provide an algorithm that calculates a fixed-window average. A digital input signal will define the start of the window period (e.g., signal from utility meter) to synchronize the fixed-window average with that used by the utility.
- O. Anti-Short Cycling. All binary output objects shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- P. On/Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and set point. The algorithm shall be direct-acting or reverse-acting and incorporate an adjustable differential.
- Q. Run-Time Totalization. Provide software to totalize run-times for all binary input objects. A high run-time alarm shall be assigned, if required, by the operator.

# 2.5 NOT USED

# 2.6 CUSTOM APPLICATION CONTROLLERS

- A. General. Provide an adequate number of Custom Application Controllers to achieve the performance specified in the Part 1 Article on "System Performance." Each of these panels shall meet the following requirements.
  - 1. The custom application controller shall have sufficient memory to support its operating system, database, and programming requirements.
  - 2. Data shall be shared between networked custom application controllers.
  - 3. The operating system of the controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms.
  - 4. Controllers that perform scheduling shall have a real-time clock.
  - 5. The custom application controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall
    - a. assume a predetermined failure mode and
    - b. generate an alarm notification.
  - 6. The custom application controller shall communicate with other BACnet devices on the internetwork using the Read (Execute and Initiate) and Write (Execute and Initiate) Property services as defined in Clauses 15.5 and 15.9, respectively, of ANSI/ASHRAE Standard 135-2004.

# B. Communication.

- 1. Each custom application controller shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.
- 2. The controller shall provide a service communication port using BACnet Data Link/Physical layer protocol for connection to a portable operator's terminal.
- C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
  - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 40°F to 150°F.
  - 2. Controllers used in conditioned space shall be mounted in dustproof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- D. Keypad. A local keypad and display shall be provided. The keypad shall be provided for interrogating and editing data. An optional system security password shall be available to prevent unauthorized use of the keypad and display.
- E. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
- F. Memory. The custom application controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
- G. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

# 2.7 APPLICATION SPECIFIC CONTROLLERS

A. General. Application specific controllers (ASCs) are microprocessor-based DDC controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user-programmable but are customized for operation within the confines of the equipment they are designed to serve. Application specific controllers shall communicate with other BACnet devices on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of ANSI/ASHRAE Standard 135-2004.

- 1. Each ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
- 2. Each ASC will contain sufficient I/O capacity to control the target system.
- B. Communication.
  - 1. The controller shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol. Each network of controllers shall be connected to one building controller.
  - 2. Each controller shall have a BACnet Data Link/Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown.
- C. Environment. The hardware shall be suitable for the anticipated ambient conditions.
  - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 40°F to 150°F.
  - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 32°F to 120°F.
- D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
- E. Memory. The application specific controller shall use nonvolatile memory and maintain all BIOS and programming information in the event of a power loss.
- F. Immunity to power and noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- G. Transformer. Power supply for the ASC must be rated at a minimum of 125% of ASC power consumption and shall be of the fused or current limiting type.

# 2.8 INPUT/OUTPUT INTERFACE

- A. Hardwired inputs and outputs may tie into the system through building, custom application, or application specific controllers.
- B. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no damage to the controller.
- C. Binary inputs shall allow the monitoring of On/Off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
- D. Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects and also accept up to 10 pulses per second for pulse accumulation.
- E. Analog inputs shall allow the monitoring of low-voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with—and field configurable to— commonly available sensing devices.
- F. Binary outputs shall provide for On/Off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have three-position (On/Off/Auto) override switches and status lights. Outputs shall be selectable for either normally open or normally closed operation.
- G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on building or custom application controllers shall have status lights and a two-position (AUTO/MANUAL) switch and manually adjustable potentiometer for manual override. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.
- H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

- I. Input/Output points shall be the universal type, i.e., controller input or output may be designated (in software) as either a binary or analog type point with appropriate properties. Application specific controllers are exempted from this requirement.
- J. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

# 2.9 POWER SUPPLIES AND LINE FILTERING

- A. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in both primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
  - 1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand a 150% current overload for at least three seconds without trip-out or failure.
    - a. Unit shall operate between 32°F and 120°F. EM/RF shall meet FCC Class B and VDE 0871 for Class B and MIL-STD 810C for shock and vibration.
  - b. Line voltage units shall be UL recognized and CSA approved.
- B. Power line filtering.
  - 1. Provide transient voltage and surge suppression for all workstations and controllers either internally or as an external component. Surge protection shall have the following at a minimum:
    - a. Dielectric strength of 1000 volts minimum
    - b. Response time of 10 nanoseconds or less
    - c. Transverse mode noise attenuation of 65 dB or greater
    - d. Common mode noise attenuation of 150 dB or better at 40 Hz to 100 Hz

# 2.10 AUXILIARY CONTROL DEVICES

- A. Motorized control dampers, unless otherwise specified elsewhere, shall be as follows:
  - 1. Control dampers shall be the parallel or opposed blade type as indicated on the drawings.
  - 2. Damper frames shall be minimum 13-gauge galvanized steel channel or 1/8 in. extruded aluminum with reinforced corner bracing.
  - 3. Damper blades shall not exceed 8 inches in width or 48 inches in length. Blades are to be suitable for medium velocity performance [2,000 fpm]. Blades shall be not less than 16 gauge.
  - 4. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze or better.
  - 5. All blade edges and top and bottom of the frame shall be provided with replaceable butyl rubber or neoprene seals. Side seals shall be spring-loaded stainless steel. The blade seals shall provide for a maximum leakage rate of 10 cfm per square foot at 4 in. w.g. differential pressure. Provide airfoil blades suitable for a wide-open face velocity of 1,500 fpm.
  - 6. Individual damper sections shall not be larger than 48 inches × 60 inches. Provide a minimum of one damper actuator per section.
  - 7. Modulating dampers shall provide a linear flow characteristic where possible.
  - 8. Dampers shall have exposed linkages.
- B. Electric damper/valve actuators.
  - 1. The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.
  - 2. Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing. Alternatively, an uninterruptible power supply (UPS) may be provided.
  - 3. Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range.
  - 4. All 24 VAC/VDC actuators shall operate on Class 2 wiring as defined in the National Electrical Code.

- 5. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 60 in.-lb. torque capacity shall have a manual crank for this purpose.
- C. Temperature sensors.
  - 1. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
  - Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m<sup>2</sup> (10 ft<sup>2</sup>) of duct cross section.
  - 3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the flow velocities in the pipe.
  - 4. Space sensors shall be equipped with set point adjustment, override switch, display, and/or communication port as shown.
  - 5. Provide matched temperature sensors for differential temperature measurement.

# D. Humidity sensors.

- 1. Duct and room sensors shall have a sensing range of 20% to 80%.
- 2. Duct sensors shall be provided with a sampling chamber.
- 3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of 40°F to 170°F.
- 4. Humidity sensor's drift shall not exceed 1% of full scale per year.
- E. Flow switches.
  - 1. Flow-proving switches shall be either paddle or differential pressure type, as shown.
  - Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum) and shall have adjustable sensitivity with NEMA 1 enclosure unless otherwise specified.
  - Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application or as specified.
- F. Relays.
  - 1. Control relays shall be UL listed plug-in type with dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
  - 2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable ±200% (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.
- G. Override timers.
  - 1. Override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration as required by application. Provide 0-to-6-hour calibrated dial unless otherwise specified. Timer shall be suitable for flush mounting on control panel face and located on local control panels or where shown.
- H. Current transmitters.
  - AC current transmitters shall be the self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, with internal zero and span adjustment and ±1% full-scale accuracy at 500 ohm maximum burden.
  - 2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA Recognized.
  - 3. Unit shall be split-core type for clamp-on installation on existing wiring.
- I. Current transformers.
  - 1. AC current transformers shall be UL/CSA Recognized and completely encased (except for terminals) in approved plastic material.
  - 2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.
  - 3. Transformers shall be fixed-core or split-core type for installation on new or existing wiring, respectively.
- J. Voltage transmitters.
  - 1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- 2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC fullscale, adjustable, with ±1% full-scale accuracy with 500 ohm maximum burden.
- 3. Transmitters shall be UL/CSA Recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.
- K. Voltage transformers.
  - 1. AC voltage transformers shall be UL/CSA Recognized, 600 VAC rated, complete with built-in fuse protection.
  - 2. Transformers shall be suitable for ambient temperatures of 4°C to 55°C (40°F to 130°F) and shall provide ±0.5% accuracy at 24 VAC and a 5 VA load.
  - 3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.
- L. Power Monitors
  - 1. Selectable rate pulse output for kWh reading, 4–20 mA output for kW reading, N.O. alarm contact, and ability to operate with 5.0 amp current inputs or 0–0.33 volt inputs.
  - 2. 1.0% full-scale true RMS power accuracy, + 0.5 Hz, voltage input range 120–600 V, and auto range select.
  - 3. Under voltage/phase monitor circuitry.
  - 4. NEMA 1 enclosure.
  - 5. Current transformers having a 0.5% FS accuracy, 600 VAC isolation voltage with 0–0.33 V output. If 0–5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.
- M. Thermal Energy Meters
  - 1. Matched RTD or thermistor temperature sensors with a differential temperature accuracy of ±0.15°F.
  - 2. Flow meter that is accurate within ±1% at calibrated typical flow rate and does not exceed ±2% of actual reading over an extended 50:1 turndown range.
  - 3. Unit accuracy of ±1% factory calibrated, traceable to NIST with certification.
  - 4. NEMA 1 enclosure.
  - 5. Panel mounted display.
  - 6. UL listed.
  - 7. Isolated 4–20 ma signals for energy rate and supply and return temperatures and flow.
- N. Current switches.
  - 1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.
- O. Pressure transducers.
  - 1. Transducer shall have linear output signal. Zero and span shall be field adjustable.
  - 2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.
  - 3. Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and block and bleed valves.
  - 4. Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (differential pressure) and maximum static pressure shall be 300 psi. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and five-valve manifold.
- P. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application or as shown.
- Q. Pressure-Electric (PE) Switches.
  - 1. Shall be metal or neoprene diaphragm actuated, operating pressure rated 0-175 kPa (0-25 psig), with calibrated scale setpoint range of 14-125 kPa (2-18 psig) minimum, UL listed.
  - 2. Provide one- or two-stage switch action SPDT, DPST, or DPDT, as required by application. Electrically rated for pilot duty service (125 VA minimum) and/or for motor control.
  - 3. Shall be open type (panel-mounted) or enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.
  - 4. Shall have a permanent indicating gauge on each pneumatic signal line to PE switches.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

### R. Electro-pneumatic (E/P) transducers.

- 1. Electronic/pneumatic transducer shall provide a proportional 20 to 100 kPa (3 to 15 psig) output signal from either a 4 to 20 mA or 0 to 10 VDC analog control input.
- 2. E/P transducer shall be equipped with the following features:
  - a. Separate span and zero adjustments
  - b. Manual output adjustments
  - c. Pressure gauge assembly
  - d. Feedback loop control
  - e. Air consumption of 0.05 L/s (0.1 scfm) at mid-range
- S. Local control panels.
  - 1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable subpanels. A single key shall be common to all field panels and subpanels.
  - 2. Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
  - 3. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.

### 2.11 WIRING AND RACEWAYS

- A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 16.
- B. All insulated wire to be copper conductors, UL labeled for 90°C minimum service.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.
- B. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.
- C. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the contractor to report such discrepancies shall be made by—and at the expense of—this contractor.

# 3.2 PROTECTION

- A. The contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.
- B. The contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The contractor shall protect any material that is not immediately installed. The contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

### 3.3 COORDINATION

- A. Site
  - Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any

Birmingham Pump Station Screen Replacement Kansas City, Missouri

interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.

- 2. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.
- B. Submittals. Refer to the "Submittals" article in Part 1 of this specification for requirements.
- C. Test and Balance
  - 1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
  - 2. The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.
  - 3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
  - 4. The tools used during the test and balance process will be returned at the completion of the testing and balancing.
- D. Life Safety
  - 1. Duct smoke detectors required for air handler shutdown are supplied under Division 16 of this specification. The contractor shall interlock smoke detectors to air handlers for shutdown as described in Part 3, "Sequences of Operation."
  - Smoke dampers and actuators required for duct smoke isolation are provided under a Section of Division 15. The contractor shall interlock these dampers to the air handlers as described in Part 3, "Sequences of Operation."
  - 3. Fire/smoke dampers and actuators required for fire rated walls are provided under another Section of Division 15. Control of these dampers shall be by Division 16. The contractor shall provide control air to the dampers.
- E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
  - 1. All communication media and equipment shall be provided as specified in Part 2, "Communication" of this specification.
  - 2. Each supplier of a controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.
  - 3. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.
  - 4. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
  - 5. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

#### 3.4 GENERAL WORKMANSHIP

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

# 3.5 FIELD QUALITY CONTROL

- A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this specification.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.
- C. Contractor shall have work inspected by local and/ or state authorities having jurisdiction over the work.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

### 3.6 EXISTING EQUIPMENT

- A. Wiring: The contractor may not reuse abandoned wiring from the past.
- B. Local Control Panels: {The contractor may reuse any existing local control panel to locate new equipment. All redundant equipment within these panels must be removed. Panel face cover must be patched to fill all holes caused by removal of unused equipment or replaced with new.} {Remove and deliver to owner.} {Existing panels become the property of the contractor.} {Salvage, recondition, and reuse existing devices and cabinets as noted. Relocate as shown.}
- C. Unless otherwise directed, the contractor is not responsible for the repairs or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the contractor find existing equipment that requires maintenance, the engineer is to be notified immediately.
- D. Temperature Sensor Wells: The contractor may reuse any existing wells in piping for temperature sensors. These wells shall be modified as required for proper fit of new sensors.
- E. Indicator Gauges: Where these devices remain and are not removed, they must be made operational and recalibrated to ensure reasonable accuracy. Maintain the operation of existing pneumatic transmitters and gauges.
- F. Room Thermostats: {Salvage, recondition, and reuse} {Deliver to Owner} {Shall be removed and become the property of the contractor, unless otherwise noted}.
- G. Electronic Sensors and Transmitters: Unless specifically noted otherwise, {remove and deliver to the Owner} {become the property of the contractor}.
- H. Controllers and Auxiliary Electronic Devices: {Deliver to the owner} {Salvage, recondition, and reuse} {Become the property of the contractor}.
- I. Pneumatic Controllers, Relays and Gauges: {Deliver to owner} {Become the property of the contractor}.
- J. Damper Actuators, Linkages, and Appurtenances: {Deliver to owner} {Salvage, recondition, and reuse} {Become the property of the contractor}.
- K. Control Valves: {Replace with new} {Salvage, recondition, and reuse} {Become the property of the contractor}.
- L. Control Compressed Air System: {Deliver to owner and replace with new system} {Salvage, recondition, and reuse} {Becomes the property of the contractor, unless otherwise noted}.
- M. The mechanical system must remain in operation between the hours of 6 a.m. and 6 p.m., Monday through Friday. No modifications to the system shall cause the mechanical system to be shut down for more than 15 minutes or to fail to maintain space comfort conditions during any such period. Perform cut-over of controls that cannot meet these conditions outside of those hours.
- N. The scheduling of fans through existing or temporary time clocks or control system shall be maintained throughout the DDC system installation.
- O. Install control panels where shown.
- P. Modify existing starter control circuits, if necessary, to provide hand/off/auto control of each starter controlled. If new starters or starter control packages are required, these shall be included as part of this contract.
- Q. Patch holes and finish to match existing walls.

# 3.7 WIRING

- A. All control and interlock wiring shall comply with national and local electrical codes and Division 16 of this specification. Where the requirements of this section differ from those in Division 16, the requirements of this section shall take precedence.
- B. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway according to NEC and Division 16 requirements.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be subfused when required to meet Class 2 current limit.)
- D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenums shall be UL Listed specifically for that purpose.
- E. All wiring in mechanical, electrical, or service rooms—or where subject to mechanical damage— shall be installed in raceway at levels below 3 m (10 ft).

- F. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing highvoltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
- G. Do not install wiring in raceway containing tubing.
- H. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.
- I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.
- J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.
- K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.
- M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.
- N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.
- O. Size of raceway and size and type of wire shall be the responsibility of the contractor, in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.
- P. Include one pull string in each raceway 2.5 cm (1 in.) or larger.
- Q. Use coded conductors throughout with conductors of different colors.
- R. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.
- S. Conceal all raceways, except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g., steam pipes or flues).
- T. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.
- U. Adhere to this specification's Division 16 requirements where raceway crosses building expansion joints.
- V. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all vertical raceways.
- W. The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- X. Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.
- Y. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

# 3.8 COMMUNICATION WIRING

- A. The contractor shall adhere to the items listed in the Wiring" article in Part 3 of the specification.
- B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.
- C. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
- D. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
- E. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.
- F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to the manufacturer's instructions.
- G. All runs of communication wiring shall be unspliced length when that length is commercially available.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- H. All communication wiring shall be labeled to indicate origination and destination data.
- I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

### 3.9 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequately for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
- D. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.
- F. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m of sensing element for each 1 m2 (1 ft of sensing element for each 1 ft2) of coil area.
- G. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.
- H. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.
- I. Differential air static pressure.
  - 1. Supply Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the lowpressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.
  - 2. Return Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the lowpressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.
  - 3. Building Static Pressure: Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
  - 4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
  - 5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
  - 6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shutoff valves installed before the tee.

#### 3.10 FLOW SWITCH INSTALLATION

- A. Use correct paddle for pipe diameter.
- B. Adjust flow switch in accordance with manufacturer's instructions.

# 3.11 ACTUATORS

- A. Mount and link control damper actuators according to manufacturer's instructions.
  - 1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
  - 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
  - 3. Provide all mounting hardware and linkages for actuator installation.
- B. Electric/Electronic
  - 1. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.
  - 2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

#### C. Pneumatic Actuators

- 1. Size pneumatic damper actuator to operate the related control damper(s) with sufficient reserve power to provide smooth modulating action or two-position action. Actuator also shall be sized for proper speed of response at the velocity and pressure conditions to which the control damper is subject.
- 2. Pneumatic damper actuators shall produce sufficient torque to close off against the maximum system pressures encountered. Size the pneumatic damper actuator to close off against the fan shutoff pressure, as a minimum.
- 3. Where two or more pneumatic damper actuators are installed for interrelated operation in unison, such as dampers used for mixing, provide the dampers with a positive pilot positioner. The positive pilot positioner shall be directly mounted to the pneumatic damper actuator and have pressure gauges for supply input and output pressures.
- 4. The total damper area operated by an actuator shall not exceed 80% of the manufacturer's maximum area rating. Provide at least one actuator for each damper section. Each damper actuator shall not power more than 2 m2 (20 ft2) of damper.
- 5. Use line shafting or shaft couplings (jackshafting) in lieu of blade-to-blade linkages or shaft coupling when driving axially aligned damper sections.

### 3.12 WARNING LABELS

- A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the DDC system.
  - 1. Labels shall use white lettering (12-point type or larger) on a red background.
  - 2. Warning labels shall read as follows:



- B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.
  - 1. Labels shall use white lettering (12-point type or larger) on a red background.
  - 2. Warning labels shall read as follows:



# 3.13 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 5 cm (2 in.) of termination with the DDC address or termination number.
- B. All pneumatic tubing shall be labeled at each end within 5 cm (2 in.) of termination with a descriptive identifier.
- C. Permanently label or code each point of field terminal strips to show the instrument or item served.
- D. Identify control panels with minimum 1 cm (1/2 in.) letters on laminated plastic nameplates.
- E. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.
- F. Identify room sensors relating to terminal box or valves with nameplates.
- G. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.
- H. Identifiers shall match record documents.

### 3.14 CONTROLLERS

- A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.
- B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used.
  - 1. Future use of spare capacity shall require providing the field device, field wiring, point database definition, and custom software. No additional controller boards or point modules shall be required to implement use of these spare points.

### 3.15 PROGRAMMING

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free for future use.
- B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index. Use the following naming convention: AA.BBB.CCDDE where
  - 1. AA is used to designate the location of the point within the building, such as mechanical room, wing, or level, or the building itself in a multi-building environment,
  - 2. BBB is used to designate the mechanical system with which the point is associated (e.g., A01, HTG, CLG, LTG),
  - 3. CC represents the equipment or material referenced (e.g., SF for supply fan, RW for return water, EA for exhaust air, ZN for zone),
  - 4. D or DD may be used for clarification or for identification if more than one CC exists (e.g., SF10, ZNB),
  - 5. E represents the action or state of the equipment or medium (e.g., T for temperature, H for humidity, C for control, S for status, D for damper control, I for current).

#### C. Software Programming

1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the contractor. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:

### a. Text-based:

- 1) Must provide actions for all possible situations
- 2) Must be modular and structured
- 3) Must be commented
- b. Graphic-based:
  - 1) Must provide actions for all possible situations
  - 2) Must be documented
- c. Parameter-based:
  - 1) Must provide actions for all possible situations
  - 2) Must be documented
- D. Operator Interface
  - 1. Standard graphics—Provide graphics for all mechanical systems and floor plans of the building. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as set points.
  - 2. Show terminal equipment information on a "graphic" summary table. Provide dynamic information for each point shown.
  - 3. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

# 3.16 CONTROL SYSTEM CHECKOUT AND TESTING

- A. Start-up Testing: All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner's representative is notified of the system demonstration.
  - 1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
  - 2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
  - 3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers' recommendations.
  - 4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
  - 5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
  - Verify that the system operation adheres to the sequences of operation. Simulate and observe all
    modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum
    start/stop routines.
  - 7. Alarms and Interlocks:
    - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the failsafe condition for all actuators is in the proper direction.
    - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

# 3.17 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

# A. Demonstration

- 1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
- 2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" article in Part 3 of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
- 3. The demonstration process shall follow that approved in Part 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
- 4. The contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.
- 5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
- 6. Demonstrate compliance with Part 1, "System Performance."
- 7. Demonstrate compliance with sequences of operation through all modes of operation.
- 8. Demonstrate complete operation of operator interface.
- 9. Additionally, the following items shall be demonstrated:
  - a. DDC loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled

Birmingham Pump Station Screen Replacement Kansas City, Missouri

variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.

- b. Demand limiting. The contractor shall supply a trend data output showing the action of the demand limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.
- c. Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of-value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
- d. Interface to the building fire alarm system.
- e. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.
- 10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.
- B. Acceptance
  - All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.
  - 2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, "Submittals."

# 3.18 CLEANING

- A. The contractor shall clean up all debris resulting from his/her activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
- B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
- C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

# 3.19 TRAINING

- A. Provide a minimum of four on-site or classroom training sessions, three days each, throughout the contract period for personnel designated by the owner.
- B. Provide two additional training sessions at 6 and 12 months following building's turnover. Each session shall be three days in length and must be coordinated with the building owner.
- C. Train the designated staff of owner's representative and owner to enable them to do the following:
  - 1. Day-to-day Operators:
    - a. Proficiently operate the system
    - b. Understand control system architecture and configuration
    - c. Understand DDC system components
    - d. Understand system operation, including DDC system control and optimizing routines (algorithms)
    - e. Operate the workstation and peripherals
    - f. Log on and off the system
    - g. Access graphics, point reports, and logs
    - h. Adjust and change system set points, time schedules, and holiday schedules
    - i. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
    - j. Understand system drawings and Operation and Maintenance manual
    - k. Understand the job layout and location of control components

Birmingham Pump Station Screen Replacement Kansas City, Missouri

Direct Digital Control System

- I. Access data from DDC controllers and ASCs
- m. Operate portable operator's terminals
- 2. Advanced Operators:
  - a. Make and change graphics on the workstation
  - b. Create, delete, and modify alarms, including annunciation and routing of these
  - c. Create, delete, and modify point trend logs and graph or print these both on an ad-hoc basis and at user-definable time intervals
  - d. Create, delete, and modify reports
  - e. Add, remove, and modify system's physical points
  - f. Create, modify, and delete programming
  - g. Add panels when required
  - h. Add operator interface stations
  - i. Create, delete, and modify system displays, both graphical and others
  - j. Perform DDC system field checkout procedures
  - k. Perform DDC controller unit operation and maintenance procedures
  - I. Perform workstation and peripheral operation and maintenance procedures
  - m. Perform DDC system diagnostic procedures
  - n. Configure hardware including PC boards, switches, communication, and I/O points
  - o. Maintain, calibrate, troubleshoot, diagnose, and repair hardware
  - p. Adjust, calibrate, and replace system components
- 3. System Managers/Administrators:
  - a. Maintain software and prepare backups
  - b. Interface with job-specific, third-party operator software
  - c. Add new users and understand password security procedures
- D. These objectives will be divided into three logical groupings. Participants may attend one or more of these, depending on level of knowledge required.
  - 1. Day-to-day Operators: parts 1-13
  - 2. Advanced Operators: parts 1-29
  - 3. System Managers/Administrators: parts 1-13 and 30-32
- E. Provide course outline and materials in accordance with the "Submittals" article in Part 1 of this specification. The instructor(s) shall provide one copy of training material per student.
- F. The instructor(s) shall be factory-trained instructors experienced in presenting this material.
- G. Classroom training shall be done using a network of working controllers representative of the installed hardware.
- 3.20 SEQUENCES OF OPERATION

A. [Provide operation as shown on drawings].

CONTROL DAMPER INSTALLATION

- B. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
- C. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4 in. larger than damper dimensions and shall be square, straight, and level.
- D. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm (1/8 in.) of each other.
- E. Follow the manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- F. Install extended shaft or jackshaft according to manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- G. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- H. Provide a visible and accessible indication of damper position on the drive shaft end.

Birmingham Pump Station Screen Replacement Kansas City, Missouri

- I. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- J. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

### 3.21 DUCT SMOKE DETECTION

- A. Submit data for coordination of duct smoke detector interface to HVAC systems as required in Part 1, "Submittals."
- B. This Contractor shall provide a dry-contact alarm output in the same room as the HVAC equipment to be controlled.
- 3.22 CONTROLS COMMUNICATION PROTOCOL
  - A. General. The electronic controls packaged with this equipment shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these controls to read the information and change the control set points as shown in the points list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ANSI/ASHRAE Standard 135-2004 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of Standard 135-2004.
  - B. Distributed Processing. The controller shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
  - C. I/O Capacity. The controller shall contain sufficient I/ O capacity to control the target system.
  - D. Communication. The controller shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol. Each network of controllers shall be connected to one building controller.
  - E. The Controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool.
  - F. Environment. The hardware shall be suitable for the anticipated ambient conditions.
    - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 40°C to 65°C ( 40°F to 150°F).
    - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
  - G. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
  - H. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.
  - I. Immunity to Power and Noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
  - J. Transformer. Power supply for the Controller must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

#### 3.23 START-UP AND CHECKOUT PROCEDURES

- A. Start up, check out, and test all hardware and software and verify communication between all components.
  - 1. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
  - 2. Verify that all analog and binary input/output points read properly.
  - 3. Verify alarms and interlocks.
  - 4. Verify operation of the integrated system.

# END OF SECTION

#### SECTION 15928 INSTRUMENTATION AND CONTROL ELEMENTS (NON-HVAC CONTROLS)

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. Develop the control system applications to implement the operational control descriptions for all systems as specified in Part 3 of the specifications. This section is provided to clarify control strategies to be used to program the system. The PCSS will not be programming any vendor PLC and HMI equipment. Contractors shall provide all work necessary to install includes but not limited to bar screens, level sensors, conveyor, odor control equipment, gate actuators and associated power distribution equipment.
- B. Programming the PLC controls shall be by the KCMO Water Services.
- C. Contractor shall provide all labor and material as shown on the drawings and provide for the coordination of operation with all connections required and as shown on the drawings for a complete and working system.

#### 1.02 RELATED WORK

A. Refer to the Instrumentation and Control drawings.

#### PART 2 PRODUCTS

- 2.01 RELATED WORK
  - A. Expansion of the existing PLC with Allen Bradley equipment to accommodate added functionalities. Refer to the Instrumentation and Control drawings.
  - B. Reference the fact that the equipment being purchased is provided with factory installed controls.
  - C. Connections include with the new level sensing equipment from Rosemount.

#### PART 3 EXECUTION

- 3.01 GENERAL
  - A. The following loop descriptions are broken into areas. The following is a list of areas and the loop numbers associated with each area.
    - 1. Influent Flow Loop 100
    - 2. Slide Gates Loops 102-106
    - 3. Bar Screens System Loops 111-142
    - 4. Channel Level Loop 100&110

- 5. Conveyor System Loops 300-399
- 6. Odor control and Hydrogen Sulfide Detection Loop 161
- 7. Combustible Gas Detection Loop 162

The loop descriptions, for each area, are sorted by loop number.

- B. The control descriptions are broken into a hierarchical layer concept. There may be one layer or multiple layers per loop, depending upon that loop. An example of multiple layered loops is as follows.
  - 1. The lowest layer of control, local control, is at that piece of equipment or that piece of equipment's panel or drive. This shall also have the highest priority.
  - 2. The second layer would be at the vendor's PLC or microprocessor touchscreen station (OIT).
  - 3. The highest layer of control is the SCADA/HMI in the main control room, remote office locations, and satellite locations' operator interface terminals (OITs). SCADA/HMI refers to both the SCADA PLC, which does the actual monitoring and control logic for the process equipment and the SCADA operator workstation (HMI), which are computers that have graphical software that interface to the PLC software for monitoring and implementing all operator-required tasks to control that process equipment. Any functions done in the HMI also take place at all the SCADA (OITs).

# 3.02 CONTROL FUNCTION DEFINITIONS AND GENERAL CRITERIA

- A. The hardware and/or software functions noted by this paragraph reference are to be implemented by the SCADA/HMI: control system specified herein.
- B. The following list of ISA abbreviations is typical of those utilized. The description, following the abbreviation, summarizes the basic function to be implemented in the SCADA/HMI software.
  - 1. HS: Represent selector switches or pushbuttons, which shall be implemented by keyboard entry. Function shall be similar to their hardware counterparts. Examples are as follows:
    - a. HSO-Open Command.
    - b. HSC-Close Command.
    - c. HSS-Start/Stop Command.
  - 2. YI: Represents equipment status (i.e., availability, running, in remote, etc.) implemented by a change of color on the HMI symbol for this equipment. For motor driven equipment such as pumps, bar screens, gate actuators, etc., availability contact represents remote operation and no alarm conditions. Examples are as follows:
    - a. YI-Selector switch in computer, auto or remote position.
    - b. YIR-Motor running status.
    - c. YA-VFD fault or overload status.
    - d. YMI-Selector switch in maintenance position.
  - 3. TAH, YA, YL, AAH etc.: Represent high or low alarms implemented on the SCADA/HMI.
  - 4. LIT, FIT etc.: Represent indicating transmitters to the PLC.
  - 5. YI, ZIC, ZIO, HCC etc.: Represent digital output display on the OIT of a process variable

in engineering units and/or a dynamic representation of the variable by symbol or graphical means.

- 6. ZSO, ZSC etc.: Represent opened or closed limit positions implemented on the SCADA/HMI
- C. Any interlocks that are represented, before the local operational descriptions, or are stated as hardwired interlocks, shall interlock all the controls locally and at the SCADA/HMI: or at the vendor PLCs. The SCADA PLC shall be programmed to shut down that equipment if that hardwired interlock is also wired to the SCADA PLC.
- D. Any interlocks that are represented in a particular layer of the operational descriptions, shall interlock all the controls in that layer and the layer after it. However, the interlock shall not interlock the commands in the layer before it.
- E. The SCADA system shall stop a motor or drive in its program if it does not receive the auto or remote status after an adjustable time delay or one of its software interlocks trips. If the drive or motor is in hand or remote it will continue to run but the SCADA start/stop output will be open.
- F. All motors that are requested to start by an operator or an automatic program shall alarm if the run confirm status for that motor does not activate within a short, operator adjustable value. If a motor stops by an interlock or stops without any operator or SCADA intervention, then that motor shall go into alarm. All motors that are stopped by a program or the operator shall not go into an alarm.
- G. Terminology associated with interlocks is as follows:
  - 1. When a contact or status is true, the SCADA computer will receive power to its input channel. The SCADA computer registers this as a binary bit of one.
  - 2. When a contact or status is false, the SCADA computer will receive no power (open circuit) to its input channel. The SCADA computer registers this as a binary bit of zero.
- H. When an analog signal goes outside the 3.5-20.5 mA range due to a failure at the instrument or PLC card, the following SCADA programming shall take place:
  - 1. Alarm the signal.
  - 2. If the analog signal is associated with a control loop or ratio control loop that loop shall go into manual.
  - 3. If the analog signal is used in a calculation, that calculation shall use the last analog signal value (if used for longer than adjustable minimum duration initially set at 10 minutes).
  - 4. The analog signal's engineering output shall process according to operator selection:
    - a. Continue to process the failed input for calculation (falling to minimum or rising to maximum engineering unit display).
  - 5. Freeze engineering output value at last valid value prior to rapid change.
- I. All interlocks that shutdown (Stop a piece of equipment and prevent it from being restarted or moved) shall be shown on the faceplate pop-up graphic for that piece of equipment. An adjustable time delay shall be provided for all software interlocks.

J. All flow indications shall be totalized if not already done so. Do not totalize if the analog signal is outside the 3.5-20.5 mA range. Each flow totalization shall come with a reset button on the HMI screen and is password protected. Do not totalize if the value of the flow input is less than 2% of the full range of the input.

# 3.03 INDIVIDUAL CONTROL LOOP DESCRIPTIONS AND CONTROL SEQUENCES

# LOOP INDEX

LOOP	NO.	DESCRIPTION	PAGE NO.
LOOP	100	INFLUENT FLOW	4
LOOP	102-108	BAR SCREEN MOTORIZED CONTROL GATES	5
LOOP	111-142	BAR SCREEN SYSTEM (P&ID I-5) (VENDOR PROVIDED)	6
LOOP	100 & 110	PLANT INFLUENT CHANNEL LEVEL	7
LOOP	300-399	CONVEYOR (VENDOR PROVIDED)	7
LOOP	161	ODOR CONTROL (VENDOR PROVIDED)	8
LOOP	161	HYDROGEN SULFIDE DETECTION	8
LOOP	162	COMBUSTIBLE GAS DETECTION	9

# LOOP 100 INFLUENT FLOW

Continuous flow measurement by means of an ultrasonic level meter. Pump Station influent flow in the Influent Structure.

I-5
FE/FIT-100
None.

Alarms / Monitoring:

Local:

Flow indication (FIT-100)

# SCADA/HMI:

Flow indication (FI-100)

### LOOP 102-108 SLIDE GATES

Six motorized slide gates (GATE-002 to GATE-004 and GATE-007 to GATE-009) will be installed upstream or downstream of the Bypass Channel and the Course Screens (SCR-003-A and SCR004-A). An additional motorized slide gate (GATE-011) will be installed between the West Wet Well and the East Wet Well. The motorized slide gates are designed with local controls, with remote monitoring, and shall be capable of remote control.

The control gates will be used to allow gravity flow from the facility into the screens when determined by the operator or based on the influent channel level setpoint, outlined in LIT-110 loop.

Flow will enter Course Screen SCR-003-A when GATE-003 is open. GATE-008 is located downstream of the course screen and will allow discharge to the wet well.

Flow will enter Course Screen SCR-004-A when GATE-004 is open. GATE-009 is located downstream of the course screen and will allow discharge to the wet well.

The gates will actuate when selected by the operator in the SCADA/HMI or locally at actuator control station (LCS).

When LCS is in REMOTE, within the SCADA/HMI, a selector switch will allow the operator to select the automatic mode of controlled gate.

**P&ID:** I-5 & I-6 (for SG-106)

**Equipment:** GATE-002, GATE-003, GATE-004, GATE-007, GATE-008, GATE-009, GATE-011

#### Control:

**<u>Software Interlock:</u>** Once the respective screens are started, the influent and effluent motorized gates shall be opened after an adjustable delay.

#### Local:

- Local: When the Local-Off-Remote selector switch (HS) is in the "LOCAL" position, the gate can be open or close through pushbuttons (HS).
- Off: When the Local-Off-Remote selector switch (HS) is in the "OFF" position, the gate cannot be operated locally or remotely.
- Remote: When the Local-Off-Remote selector switch (HS) is in the "REMOTE" position, gate control is transferred to SCADA.

#### SCADA/HMI:

- Manual: The gates can be manually opened or closed by the operator at the SCADA/HMI.
- Auto: When in automatic mode, gate operation shall be controlled based on the influent channel level setpoints.

A screen level setpoint shall open associated channel gates.

A high level of the pump station influent structure (LAH-110) generated by LIT-110 shall open the influent and effluent gates of the lead bar screen.

A high-high level of the pump station influent structure (LAHH-110) generated by LITs shall issue an alarm and shall open the bypass gate GATE-002.

A low level of pump station influent structure (LAL-110) generated from LIT- 110 shall close the lag course screen channel gates.

A low-low level of the pump station influent structure (LALL-110) generated from LIT-110 shall close the Lead bar screen gates.

## Alarms / Monitoring:

### Local:

Slide Gate Full Opened Indication (ZSO-102, ZSO-103, ZSO-104, ZSO- 105, ZSO-106, ZSO-107 and ZSO-108)

Slide Gate Full Closed Indication (ZSC-102, ZSC-103, ZSC-104, ZSC- 105, ZCS-106, ZSC-107 and ZSC-108)

### SCADA/HMI:

Slide Gate in Remote (YI-102, YI-103, YI-104, YI-105, YI-106, YI-107 and YI-108)

Slide Gate Full Opened indication (ZIO-102, ZIO-103, ZIO-104, ZIO- 105, ZIO 106, ZIO-107 and ZIO-108)

Slide Gate Full Closed indication (ZIC-102, ZIC-103, ZIC-104, ZIC-105, ZIC-106, ZIC-107 and ZIC-108)

Slide Gate Fault alarm (YA-102, YA-103, YA-104, YA-105, YA-106, YA-107 and YA- 108)

Slide Gate Open command (HCO-102, HCO -103, HCO -104, HCO -105, HCO-106, HCO 107 and HCO -108)

Slide Gate Close command (HCC-102, HCC -103, HCC -104, HCC -105, HCC-106, HCC-107 and HCC -108)

# LOOP 111-142 COURSE SCREEN SYSTEM (VENDOR PROVIDED)

Two bar screen trains, consisting of mechanically cleaned coarse bar screen and two screw conveyors to remove debris from the wastewater to protect downstream equipment.

Raw wastewater entering the plant will be diverted to one of two channels. The channels go to the motorized coarse bar screens. Motorized slide gates allow the motorized bar screen's channels to be isolated. Since each mechanical bar screen can handle the peak design flow, one mechanical screen will normally be used as the lead screen, with the second as a lag. At higher flows or if the lead screen failed, the lag (standby) screen will be brought into service by manually or automatically opening the slide gates. The screenings screw conveyor will be turned on when its associated screen is assigned to run.

Service water will be provided in the bar screen and screw conveyor areas for hose connections.

The mechanical bar screens system is controlled from a local control panel with SCADA controlling/monitoring the operation. The bar screens system control shall be operated automatically in the alternative automatic modes or in manual mode as described in the sections below.

#### P&ID: 1-5

**Equipment:** Mechanical Bar Screens No.1 & No.2, (BSC- 111 & BSC-112) located in Channel No.1 and Channel No. 2, which is comprised of:

- Mechanical bar screens (BSC-111, BSC-112) with screw conveyors (CNV-320)
- Bar screen local control station with LOR and FOR (LCS-111, LCS-112)
- Screw conveyor local control station with LOR and FOR (LCS-320)
- Bar Screens Control Panel (LCP-110), including a PLC and OIT

**Control:** All the Mechanical Bar Screens components will be operated based on vendor provided logic.

All monitoring and controls at Bar Screen system OIT HMI shall be available at SCADA/HMI.

### Alarms/Monitoring:

Bar Screen High Torque (NAH-110, NAH-110) Bar Screen High Temperature (TAH-110, TAH-110) Bar Screen in Remote (YI-110, YI-110) Bar Screen Running Forward (YIF-110, YIF-110) Bar Screen Running Reverse (YIG-110, YIG-110) Bar Screen Fault (YA-110, YA-110) Bar Screen Power Failure (JA-110, JA-110)

# LOOP 100 & 110 CHANNEL LEVEL

The plant influent channel will be installed with a level transmitter and a level float switch for level monitoring and mechanical bar screens controls.

P&ID: 1-5

Equipment: LIT-110 and LSHH-100

#### Control:

Local: None

#### SCADA/HMI:

The high level and low level as determined by LIT will be used to start and stop the bar screens and open/close the associated influent/effluent gates.

The level (LIT-110) shall be used as the process variable to software controller (LIC). The output from the controller shall control the speed of bar screen VFDs (BSC-111 or BSC-112).

The high-high level as determined by the level switch LSHH-100 will be used to warn the operator that flow is going through the bypass pipe.

#### Alarms / Monitoring:

Local:

Level indication (LIT-110 inside control panel LCP-110)

#### SCADA/HMI:

Float High-High level alarm (LAHH-110) Level indication (LI-110)

High level alarm (LAH-110)

High-High level alarm (LAHH-110) Low level alarm (LAL-110)

Low-Low level alarm (LALL-110)

#### LOOP 300-399 CONVEYOR (VENDOR PROVIDED)

One conveyor is dedicated to the two course screens. Screenings will be transported to a dumpster and liquid will be drain back to the bar screens effluent.

 P&ID:
 I-7

 Equipment:
 Conveyor System (CNV-320)

 Control:
 The conveyor is controlled from a local control station (LCS-320), with SCADA controlling/monitoring the operation. The conveyor control shall be designed to be operated automatically in the alternative automatic modes or in manual mode

described in the sections below.

Conveyor components will be operated based on vendor provided logic.

All monitoring and controls at Conveyor system OIT HMI shall be available at SCADA/HMI.

#### Alarms / Monitoring:

Conveyor in Remote (YI-320)

Conveyor Running (YIR-320)

Conveyor Fault (YA-320)

Conveyor Alarm (TAH-320)

# LOOP 161 ODOR CONTROL (VENDOR PROVIDED)

Two odor control systems are provided. Odor control piping and nozzles will be directed into the channels and wet wells as shown on the drawings.

P&ID: 1-7

**Equipment:** Odor Control (ODR-001, ODR-002)

**Control:** The odor control is controlled from a local control station (LCS-321), with SCADA controlling/monitoring the operation. The odor control shall be designed to be operated automatically in the alternative automatic modes or in manual mode described in the sections below.

Odor control components will be operated based on vendor provided logic.

All monitoring and controls at Odor Control system OIT HMI shall be available at SCADA/HMI.

# Alarms / Monitoring:

Odor Control in Remote (YI-321)

Odor Control Running (YIR-321)

Odor Control Fault (YA-321)

Odor Control Alarm (TAH-321)

# LOOP 161 HYDROGEN SULFIDE DETECTION

Hydrogen sulfide (H<sub>2</sub>S) detectors will continuously measure hydrogen sulfide concentrations in the West Wet Well and East Wet Well at the Pump Station.

The local alarm station LAS-625 will provide a gas detection annunciation at the entrance of the Pump Station and at the remote horn/strobes to warn operators of the wet well gas conditions. Alarm signal shall be retransmitted to SCADA PLC-BPS.

 P&ID:
 I-10

 Equipment:
 AE/AIT-161

Control: None

# Alarms / Monitoring:

### Local:

H2S indication (AIT-161)

Local at the LAS-625: H2S High alarm (YL-161)

### SCADA/HMI:

H2S High alarm (AAH-161)

## LOOP 162 COMBUSTIBLE GAS DETECTION

Combustible gas (LEL) detector will continuously measure combustible gas concentrations in the West Wet Well and East Wet Well at the Pump Station.

The local alarm station LAS-625 will provide a gas detection annunciation at the entrance of the Pump Station and at the remote horn/strobes to warn operators of the building gas conditions. Alarm signal shall be retransmitted to SCADA PLC-BPS.

P&ID:I-10Equipment:AE/AIT-162Control:NoneAlarms / Monitoring:Image: Combustible Gas indication (AIT-162)Local at the LAS-625:

Combustible Gas High alarm (YL-162) SCADA/HMI:

Combustible Gas High alarm (AAH-162)

END OF SECTION

#### SECTION 16050 BASIC ELECTRICAL MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Electrical equipment coordination and installation
- B. Sleeves for raceways and cables.
- C. Sleeve seals.
- D. Common electrical installation requirements.

#### 1.2 REFERENCES

- A. NFPA 70 National Electrical Code; National Fire Protection Association.
- B. Documents referenced in the specifications are intended to refer the latest edition of the standard or document in force at the time of design completion.

### 1.3 SUBMITTALS

A. Product data for each type of product indicated.

#### 1.4 QUALITY ASSURANCE

A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

#### 1.5 COORDINATION

- A. Coordinate arrangement mounting, and support of electrical equipment:
  - 1. Provide 6'-8" or higher headroom unless specific mounting heights are shown on plans.
  - 2. Provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Allow right of way for piping and conduit installed at required slope.
  - 4. Connect raceways, cables, wireways, clear of obstructions and clear of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate electrical testing of electrical, mechanical, and architectural items.

#### 1.6 DEFINITIONS

- A. ATS: Acceptance Testing Specifications
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene rubber.

### PART 2 - PRODUCTS

### 2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steele Pipe Sleeves: Stainless steel, plain ends.
- B. Coordinate sleeve selection and application with selection and application of firestopping.

### 2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type required based on the fire rating of the wall or floor being penetrated.
  - 2. Pressure plates: Stainless steel, two for each sealing element.
  - 3. Connecting Bolts and Nuts: Stainless Steel of length required to provide pressure to sealing elements.

### PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Contractor is responsible to verify existing conditions prior to beginning work.

#### 3.2 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION.

- A. Comply with NECA National Electrical Installation Standards (NEISs).
- B Measure indicated mounting heights to bottom of unit for suspended items and to entrance of unit for wall-mounting items.
- C Provide stainless steel strut with 5/16" (minimum) stainless steel expansion anchors for installation of wall mounted electrical boxes, and ¼" stainless steel expansion anchors for conduit.
- D Headroom Maintenance: If mounting heights or other location criteria are not Indicated, arrange and install components and equipment to provide maximum possible headroom consistent with the requirements of the project.
- E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. Right of Way: Give to raceways and piping systems installed at a required slope.
- G. Seismic Reinforcement. Install electrical equipment with seismic reinforcement for seismic zone 2A.

#### 3.3 EQUIPMENT HOUSEKEEPING PADS

- A. Install concrete equipment housekeeping pads flat and level in accordance with drawings, specifications, and electrical equipment manufacturer recommendations.
- B. Provide 4" high concrete housekeeping pads for all floor-mounted electrical equipment. Housekeeping pads shall extend 4" beyond the footprint of equipment unless equipment is mounted with one or more sides flush to a wall.
- C. Install conduits stubbed up in concrete prior to placing concrete. Stub up conduits a maximum of 1 inch above the level of the bottom floor of the equipment. Ensure that there is no mechanical interference with conduits and equipment floor steel.
- D. Scarify existing concrete slabs to receive new housekeeping pads. Provide dowels in existing concrete slabs and provide bonding agent for new concrete to adhere to existing concrete. Provide 45-degree chamfer edge for exposed edges of housekeeping pads.
- E. Where required, install base channels in the locations recommended by the manufacturer. Ensure that the channels lie in a flat, level plane in accordance with the manufacturer's instructions to ensure proper alignment and to prevent distortion of the switchgear cubicles and skeleton. Ensure that non-supporting areas of the foundation are lower than the tops of the steel channels.
- F. Sweep concrete housekeeping pads and remove debris before installing any equipment.
- G. Line up bolt holes in equipment bases with the bolt holes embedded in steel channels in the foundation. Loosely install anchor bolts but do not tighten. Verify that the back of the equipment is perpendicular to the concrete pad and has proper clearance. Draw a base line along the length of the intended location of the equipment in the front of the line-up to keep the shipping sections parallel when installing subsequent sections.
- H. Where base channels are not installed, provide concrete anchors and anchor electrical equipment to concrete housekeeping pads.
- I. Upon completion, completely seal between concrete pad and steel structure to prevent entry of rodents, water, etc.

# 3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Coordinate sleeve selection and application with election and application of firestopping.
- C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used.
- D. Use pipe sleeves for wall penetrations.
- E. Fire-Rated Assemblies: Install sleeves for penetrations of rated floors.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors to a height 2 inches above the finished floor level.
- H. Size pipe sleeves to provide ¼ inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
- I. Seal space outside of sleeves with grout for penetrations of concrete or masonry.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable using joint sealant appropriate for size, depth and location of the joint.

- K. Fire-Rated Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetrations sleeves with firestop materials.
- L. Above ground exterior wall penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, exterior wall penetrations: Install cast iron wall pipes for sleeves. Size to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

# 3.4 SLEEVE SEAL INSTALLATION

- A. Install waterproof seals where raceways are exposed to different temperatures in accordance with NEC article 300.7.
- B. Install to seal underground and exterior wall penetrations in accordance with NEC article 300.5(G).
- C. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in the center of the sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates to make watertight seal.

# 3.5 FIELD QUALITY CONTROL

A. Inspect installed sleeve and sleeve-seal installations and associated firestopping for damage and faulty work.

# 3.6 TESTING AND COMMISSIONING

A. Test and commission individual equipment and components as a system in accordance with manufacturer recommended start-up procedures and in indicated in individual specification sections for equipment.

END OF SECTION

#### SECTION 16070 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

### 1.2 REFERENCES

- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- B. NFPA 70 National Electrical Code; National Fire Protection Association; 2008.

### 1.3 SUBMITTALS

A. Product Data: Provide manufacturer's catalog data for fastening systems.

### 1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

# PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners General: Stainless Steel materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of stainless steel, 6063 T6 extruded aluminum or formed stainless steel members. Support conduits using stainless steel strut.
- C. Anchors and Fasteners:
  - 1. Concrete Structural Elements: Use precast inserts, stainless steel expansion anchors, or preset inserts.
  - 2. Steel Structural Elements: Use beam clamps, stainless steel spring clips, steel ramset fasteners, or welded fasteners.
  - 3. Concrete Surfaces: Use self-drilling anchors or expansion anchors of stainless steel.
  - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use stainless steel toggle bolts or hollow wall fasteners.
  - 5. Solid Masonry Walls: Use expansion anchors or preset inserts of stainless steel.
  - 6. Sheet Metal: Use stainless steel sheet metal screws.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
  - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
  - 2. Do not drill or cut structural members.
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- C. In wet and damp locations use stainless steel channel supports and fasteners.
- D. Use stainless steel or aluminum sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

#### END OF SECTION

# SECTION 16075 IDENTIFICATION FOR ELECTRICAL SYSTEMS

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

### A. Section Includes:

- 1. Identification for raceways.
- 2. Identification of power and control cables.
- 3. Identification for conductors.
- 4. Underground-line warning tape.
- 5. Warning labels and signs.
- 6. Instruction signs.
- 7. Equipment identification labels.
- 8. Miscellaneous identification products.

# 1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

# 1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

# 1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

# PART 2 - PRODUCTS

# 2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
  - 1. Black letters on an orange field.
  - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high letters on 20-inch centers.
- D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

# 2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

# 2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

# 2.4 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

# 2.5 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
  - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
  - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
  - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
  - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.

# 2.6 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

# 2.7 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
  - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

# 2.8 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

# 2.9 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
  - 3. UL 94 Flame Rating: 94V-0.
  - 4. Temperature Range: Minus 50 to plus 284 deg F.
  - 5. Color: Black.

# 2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 9 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.
# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas. Comply with owner's established color coding for the facility.
- G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.

# 3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. Emergency Power.
  - 2. Power.
  - 3. UPS.
  - 4. Batteries.

- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
    - c. Colors for 480/277-V Circuits:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
    - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

- H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
  - 1. Comply with 29 CFR 1910.145.
  - 2. Identify system voltage with black letters on an orange background.
  - 3. Apply to exterior of door, cover, or other access.
  - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.
- I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer load shedding.
- K. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  - 1. Labeling Instructions:
    - a. Indoor Equipment: SS screws, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
    - b. Outdoor and: Engraved, laminated acrylic or melamine label.
    - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  - 2. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Switchboards and switchboard controls.

- e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
- f. Substations.
- g. Enclosed switches.
- h. Enclosed circuit breakers.
- i. Enclosed controllers.
- j. Variable-speed controllers.
- k. Push-button stations.
- 1. Power transfer equipment.
- m. Contactors.
- n. Remote-controlled switches, dimmer modules, and control devices.
- o. Battery systems.
- p. Battery racks.
- q. Battery monitoring equipment.
- r. Power-generating units.
- s. Monitoring and control equipment.
- t. UPS equipment.
- u. Conduits and ductbanks installed for future use.
- v. Power Distribution Units.
- w. Copper and fiber cables. (Coordinate with the owner for exact requirements)
- x. Air handling units and control equipment.
- y. Patch panels.
- z. Rack mounted switches.

#### SECTION 16123 BUILDING WIRE AND CABLES

# PART 1 - GENERAL

### 1.1 SECTION INCLUDES

- A. Wire and cable for 600 volts and less for power and controls.
- B. Wiring connectors and connections.

# 1.2 REFERENCES

- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NETA STD ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- C. NFPA 70 National Electrical Code; National Fire Protection Association.

# 1.3 SUBMITTALS

A. Product Data: Provide for each cable assembly type.

#### 1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

# PART 2 - PRODUCTS

#### 2.1 WIRING REQUIREMENTS

- A. Concealed Dry Interior Locations: Use only building wire in raceways, TINNED COPPER wire with Type XHHW-2 insulation.
- B. Exposed Dry Interior Locations: Use only building wire in raceways, TINNED COPPER wire with Type XHHW-2 insulation.
- C. Wet or Damp Locations: Use only TINNED COPPER wire in raceways with XHHW-2 insulation.

# 2.2 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor: Tinned Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: NFPA 70, Type XHHW-2

# 2.3 WIRING CONNECTORS

- A. Insulated set screw Connectors:
- B. Solderless Pressure Connectors:

# PART 3 - EXECUTION

# 3.1 EXAMINATION

A. Verify that raceway installation is complete and supported.

# 3.2 INSTALLATION

- A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Route wire and cable as required to meet project conditions, and as noted on drawings.
  - 1. Wire and cable routing indicated is approximate unless dimensioned.
  - 2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
- C. Use wiring methods indicated.
- D. Pull all conductors into raceway at same time.
- E. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- F. Neatly train and lace wiring inside boxes, equipment, panelboards, and switchboards.
- G. Clean conductor surfaces before installing lugs and connectors.
- H. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

# SECTION 16131 ELECTRICAL CONDUIT

# PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Conduit, fittings, and conduit bodies.
- B. Installation of cable tray systems for all work in Division 26 and 27 including required fittings and supports.

# 1.2 REFERENCES

- C. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- D. NECA 101 Standard for Installing Steel Conduit (Rigid); National Electrical Contractors Association.
- E. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, National Electrical Manufacturers Association.
- F. NEMA TC 2 Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association.
- G. NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association.
- H. NFPA 70 National Electrical Code; National Fire Protection Association; 2008.

#### 1.3 SUBMITTALS

- A. Product Data: Provide for rigid aluminum conduit, liquid tight flexible metal conduit and fittings, nonmetallic conduit, fittings, and conduit bodies, manufacturers product data.
- B. Provide complete shop drawings in accordance with Division 1 specifications for submittals.

#### 1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- 1.5 DELIVERY, STORAGE, AND HANDLING
  - A. Accept conduit on site. Inspect for damage.
  - B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

# PART 2 - PRODUCTS

#### 2.1 CONDUIT REQUIREMENTS

- A. Conduit Size: Comply with NFPA 70.1. Minimum Size: 3/4 inch unless otherwise specified.
- B. Outdoor Locations Above Grade: Use rigid aluminum conduit.
- C. Underground Locations: Schedule 40 conduit and fittings
- D. Wet and Damp Locations and dry locations: Use rigid aluminum conduit and fittings

# 2.2 METAL CONDUIT

- A. Manufacturers: All materials submitted shall comply with the Buy-American Act as instituted by the Government and as prescribed either in the Government's General Conditions of the Contract or elsewhere in the Government's bidding and contracting requirements. Every submittal shall include a statement indicating that the product(s) being submitted complies with the Buy-American Act.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- B. Fittings and threaded, gasketed, Conduit Bodies: NEMA FB 1; material to match conduit.

### 2.3 FLEXIBLE METAL CONDUIT

A. Not used

# 2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Description: Interlocked steel construction with PVC jacket.
- B. Fittings: NEMA FB 1.
- 2.5 ELECTRICAL METALLIC TUBING (EMT)

Not used

#### 2.6 NONMETALLIC CONDUIT AND FITTINGS

- A. Description: PVC, polyvinyl chloride compound rated for direct burial, ultraviolet resistant, and conforming to UL Standard 651, Schedule 40.
- 2.7 CABLE TRAY REQUIREMENTS

Not used

# PART 3 - EXECUTION

# 3.1 EXAMINATION

- A. Verify that field measurements are as shown on drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Route conduit as required to complete wiring system.

#### 3.2 CONDUIT INSTALLATION

- A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install steel conduit as specified in NECA 101.
- C. Install nonmetallic conduit in accordance with manufacturer's instructions.
- D. Install concrete encased duct banks (not used)
- E. Arrange supports to prevent misalignment during wiring installation.
- F. Support conduit using stainless steel channel and straps.
- G. Group related conduits; support using conduit rack. Construct rack using stainless steel channel.
- H. Fasten conduit supports to building structure and surfaces using stainless steel expansion anchors on concrete, and stainless-steel screws.
- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route exposed conduit parallel and perpendicular to walls.
- K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- L. Maintain adequate clearance between conduit and piping.
- M. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- N. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- O. Use threaded hubs to fasten conduit to sheet metal boxes.
- P. Install no more than equivalent of three (3) 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.
- Q. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic joints.
- R. Provide suitable pull wire in each empty conduit except sleeves and nipples.

- S. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- T. Provide an equipment grounding conductor sized per NFPA 70 in all conduits with phase conductors.

#### SECTION 16138 BOXES AND CONDUIT FITTINGS

# PART 1 - GENERAL

# 1.1 SECTION INCLUDES

- A. Device Boxes, Outlet Boxes, Junction Boxes, Pull Boxes, Cabinets and Panels
- B. Fittings for Rigid Aluminum Conduit.

#### 1.2 SUMMARY OF WORK

Specification for new conduit and fittings for that portion of the building designated as the "Wet Well" with Code classification Class 1 Division 1 or Division 2, Rigid aluminum with threaded fittings and stainless steel hangars and cast metal boxes with threaded hubs..

Specification for new exterior conduit and conduit below grade shall be rigid aluminum conduit exterior above grade and schedule 40 PVC conduit below grade.

Specification for new conduit and fittings for Exterior use and in the Motor Room shall be rigid aluminum conduit and fittings, with threaded hubs at boxes. Boxes and fittings shall be gasketed stainless steel.

Outlet boxes for cord connections shall have cast covers with gaskets and screw cover of single gang device.

#### 1.3 REFERENCES

- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
- C. NEMA OS 1 Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association.
- D. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.
- E. NFPA 70 National Electrical Code; National Fire Protection Association.

#### 1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Provide products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

# PART 2 – PRODUCTS

# 2.1 OUTLET AND DEVICE BOXES

A. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs. Provide gasketed covers with screw cover for single gang device.

#### 2.2 PULL AND JUNCTION BOXES

- A. Cast Boxes and Conduit Fittings: NEMA FB1, Type FD, aluminum. Provide gasketed cover by box manufacturer.
- B. Large Junction Boxes as noted on plans,

# PART 3 - EXECUTION

# 3.1 EXAMINATION

A. Size boxes in accordance with NFPA 70.

# 3.2 INSTALLATION

- A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1. Support boxes from structure, independently of conduits, equipment, cabinets, etc.
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- C. Coordinate installation of outlet boxes for equipment connected.

# 3.3 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

## 3.4 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

#### SECTION 16140 WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Snap switches.
  - 3. Communications outlets.

# 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

#### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

#### PART 2 - PRODUCTS

# 2.1 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Provide device colors to match adjacent devices. provide with cast aluminum cover plates.

#### 2.2 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
- C. Provide device colors to match adjacent devices, but provide stainless steel cover plates.

# 2.3 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
- C. Provide ivory device colors, and provide cast aluminum cover plates, with screw covers .

# 2.4 WALL PLATES

- A. Provide ivory device colors, and provide cast aluminum cover plates, with screw covers.
- B. Wet-Location, Weatherproof Cover Plates: Provide ivory device colors, and provide cast aluminum cover plates, with screw covers.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Comply with NECA 1 and NECA 130, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
  - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

# D. Device Installation:

- 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
- 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
- 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
- 4. Connect devices to branch circuits using pigtails that are not less than 6 inchesin length.
- 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
- 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
- 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
- 8. Tighten unused terminal screws on the device.
- 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
  - 1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
- F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom.

# 3.2 IDENTIFICATION

- A. Comply with Division 16 Section "Electrical Identification."
  - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

# 3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
  - 1. Test Instruments: Use instruments that comply with UL 1436.
  - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
  - 1. Line Voltage: Acceptable range is 105 to 132 V.
  - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
  - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
  - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
  - 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or

similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

#### SECTION 16155 EQUIPMENT WIRING

# PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Electrical connections to permanently mounted equipment.

# 1.2 REFERENCES

- A. NEMA WD 1 General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999.
- B. NEMA WD 6 Wiring Devices Dimensional Requirements; National Electrical Manufacturers Association; 2002.
- C. NFPA 70 National Electrical Code; National Fire Protection Association; 2008.

#### 1.3 SUBMITTALS

A. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

#### 1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

# 1.5 COORDINATION

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

# PART 2 – PRODUCTS

# 2.1 MATERIALS

- A. Cords and Caps: not used
- B. Liquid tight flexible metal conduit and liquid tight connectors.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

# 3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions. Install manufacturer-recommended bus bars, lugs, terminations, etc., that are compatible with wire types, insulation, sizes, and wiring methods.
- B. Make conduit connections to equipment using liquid tight flexible metal conduit and connectors for all motor connections.
- C. Connect heat-producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- E. Install terminal block jumpers to complete equipment wiring requirements.
- F. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- G. Provide liquid tight flexible metal conduit for all motor connections.

### SECTION 16281 MOLDED-CASE CIRCUIT BREAKERS

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Molded-case circuit breakers (MCCBs).
  - 2. Enclosures.

# 1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.

#### 1.3 SUBMITTALS

- A. Product Data: Provide product data for each type of enclosed switch, molded case circuit breaker or accessory.
- B. Field quality-control reports.
- C. Operation and maintenance data.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

# PART 2 - PRODUCTS

# 2.1 MOLDED-CASE CIRCUIT BREAKERS

- A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

- C. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 4X, stainless steel enclosure.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Furnish and install new molded-case circuit breakers with ratings as indicated on drawings and in existing electrical panelboards as identified on drawings.
- B. Comply with NECA National Electrical Installation Standards (NEISs).

# 3.2 IDENTIFICATION

- A. Provide engraved with 1/4" high lettering, and fastened with mechanical fasteners.
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as required in NFPA 70E.
  - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

# 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Circuit breakers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.