



**City of Kansas City, Missouri**  
**Water Department**  
**Terry Leeds, Director**

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

# Project Manual

**PROJECT/CONTRACT NO. 81000812/1541**

## **WASTE WATER TREATMENT BUILDING – BLUE RIVER ANNEX - BID #2**

PROVIDE ALTERATIONS TO EXISTING 59,973 SF WAREHOUSE AND OFFICE BUILDING TO BUILD MAINTENANCE CREW OFFICES, RESTROOMS AND LOCKER ROOMS, CONFERENCE ROOMS, AND STORAGE SPACES. THE EXISTING PRE-ENGINEERED METAL BUILDING WAS CONSTRUCTED IN 1992 AND ADDED TO IN 1994. IT WAS CLASSIFIED UNDER THE 1991 *UNIFORM BUILDING CODE* AS A B-2 OCCUPANCY. CONSTRUCTION TYPE IS II-B. THE BUILDING IS FULLY SPRINKLERED.

### **BIDDER/ADDRESS**

**Company** \_\_\_\_\_

**Contact** \_\_\_\_\_

**Address** \_\_\_\_\_

\_\_\_\_\_

**Phone** \_\_\_\_\_

**Fax** \_\_\_\_\_

**Email** \_\_\_\_\_

Project Manager: Bon Marie Gardner  
 Telephone: 816/513-0354  
 Email: [bon.marie.gardner@kcmo.org](mailto:bon.marie.gardner@kcmo.org)



## ADDENDUM NUMBER 1

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

ISSUE DATE: June 21, 2021

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on June 29, 2021, are amended as follows:

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

1. Attendance List from Pre-Bid Meeting held on Thursday; June 17, 2021.  
(See Attached)

Q1.	Do you know your existing Fire Alarm System (manufacturer on the fire alarm panel)?
A1.	“Existing system is BOSCH. Under this contract, they are to put in a new panel and tie into the existing panel.”

### Bidding Requirements

1. Delete and replace the following section:
  - a. Instructions to Bidders - #28Forward all questions in writing to the following Project Manager and Contract Administrator. Questions received less than **five (5)** 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.

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

## Meeting Summary

Total Number of Participants

19

Meeting Title Blue River Annex - Pre Bid Meeting (non-Mandatory)

Meeting Start Time 6/17/2021, 9:46:38 AM

Meeting End Time 6/17/2021, 10:30:23 AM

Full Name	Join Time	Leave Time	Duration	Email	Role
Donato, Bobbie	6/17/2021, 9:46:38 AM	6/17/2021, 10:25:56 AM	39m 18s	Bobbie.Donato@kcmo.org	Presenter
Justin Ricketts	6/17/2021, 9:46:44 AM	6/17/2021, 10:25:51 AM	39m 7s	jricketts@lippertmechanical.com	Presenter
Tom Marten	6/17/2021, 9:48:34 AM	6/17/2021, 10:25:45 AM	37m 10s	Thomas@gunterkc.com	Presenter
Tom Marten 19136604503	6/17/2021, 9:49:36 AM	6/17/2021, 10:25:46 AM	36m 9s	<a href="mailto:Thomas@gunterkc.com">Thomas@gunterkc.com</a>	Attendee
Anthony Lackey	6/17/2021, 9:52:43 AM	6/17/2021, 10:25:43 AM	32m 59s	alackey@wellner.com	Presenter
Gardner, Bon	6/17/2021, 9:54:02 AM	6/17/2021, 10:25:43 AM	31m 40s	Bon.Marie.Gardner@kcmo.org	Organizer
Corey O'Neill 18164728722	6/17/2021, 9:55:44 AM	6/17/2021, 10:01:00 AM	5m 16s	<a href="mailto:coneill@megakc.com">coneill@megakc.com</a>	Attendee
Ryan Hale (Guest)	6/17/2021, 9:57:05 AM	6/17/2021, 10:28:39 AM	31m 33s	<a href="mailto:rhale@stadiumsheetmetal.com">rhale@stadiumsheetmetal.com</a>	Presenter
Daily, Craig	6/17/2021, 9:58:07 AM	6/17/2021, 10:08:54 AM	10m 47s	Craig.Daily@kcmo.org	Presenter
Ryan Hale 18169358431	6/17/2021, 9:58:20 AM	6/17/2021, 10:25:39 AM	27m 18s	<a href="mailto:rhale@stadiumsheetmetal.com">rhale@stadiumsheetmetal.com</a>	Attendee
Austin Rethmeyer 18168122792	6/17/2021, 9:58:31 AM	6/17/2021, 10:25:39 AM	27m 8s	<a href="mailto:austin.r@infinitygroupmo.com">austin.r@infinitygroupmo.com</a>	Attendee
Corey O'Neill	6/17/2021, 9:58:52 AM	6/17/2021, 10:25:40 AM	26m 48s	coneill@megakc.com	Presenter
Anderson, Blake	6/17/2021, 9:59:38 AM	6/17/2021, 10:25:45 AM	26m 7s	Blake.W.Anderson@kcmo.org	Presenter
De Schepper, John	6/17/2021, 9:59:48 AM	6/17/2021, 10:25:46 AM	25m 58s	John.DeSchepper@kcmo.org	Presenter
Schneider, Michael	6/17/2021, 10:00:11 AM	6/17/2021, 10:25:52 AM	25m 40s	Michael.Schneider@brownandroot.c	Presenter
Herring, Brent	6/17/2021, 10:01:24 AM	6/17/2021, 10:26:01 AM	24m 36s	Brent.Herring@kcmo.org	Presenter
Brian Day (Guest)	6/17/2021, 10:01:41 AM	6/17/2021, 10:25:40 AM	23m 59s		Presenter
Leeds, Terry	6/17/2021, 10:05:55 AM	6/17/2021, 10:30:23 AM	24m 27s	Terry.Leeds@kcmo.org	Presenter
weston (Guest)	6/17/2021, 10:08:07 AM	6/17/2021, 10:25:42 AM	17m 35s		Presenter



## **ADDENDUM NUMBER 2**

Project Number 81000812/1541

Project Title: Treatment Building – Blue River Annex – Bid #2

ISSUE DATE: **June 24, 2021**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on **June 29, 2021**, are amended as follows:

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

1. Due to the current “KC Re-Opening Plan” which includes limiting the number of individuals in City Hall, we would like to communicate the plans for handling the Public Bid Opening for **June 29, 2021**.
  1. We will allow Bidders to submit their bids at City Hall, however the Bid Box will be placed in the vestibule area on the outside of the security checkpoint on the North Entrance.
  2. The Bid Box will be removed at 2:00PM per the Bidding Instructions.
  3. 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
4. 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 call in (audio only)**

[+1 872-212-5076, 539339436#](#) United States, Chicago

Phone Conference ID: 539 339 436#

[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.**



### ADDENDUM NUMBER 3

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

ISSUE DATE: June 25, 2021

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on June 29, 2021, are amended as follows:

Q2.	Can you clarify the extent of the FRP Panels and FRP Base at the Maintenance Circulation (Room 113) and Unassigned (Room 126). Will these panels be installed on the new walls or existing walls as well?
A2.	<b>FRP Panels and FRP Base will be installed only on new gypsum board walls in the locations indicated.</b>
Q3.	Who will be responsible for permit fees for the project?
A3.	<b>Contractor is responsible for permit fees.</b>
Q4.	What is the anticipated Notice to Proceed for this project?
A4.	<b>I would estimate a Notice to Proceed to be issued sometime in November.</b>
Q5.	Would you happen to have a list of the General contractors for this project?
A5.	<b>There is no list, but you can go to the KC plan room to see which Contractors have viewed the project.</b>
Q6.	On the Instructions to Bidders, it is listed as no bid to be withdrawn for 120 days. On the bid form, there is a line for holding bid pricing for 120 days. I am reading this as it is already required per the specs. How is this to be handled on our bid?
A6.	<b>Base Bid should be valid for only 90 days. Holding the bid pricing for 120 days is one of the alternates and should be included on the 00420 Alternates Form. This alternate is for the bids to be valid 120 days from bid opening.</b>
Q7.	Will owner/MEP accept voluntary alternates for the Basis of design manufacturer above Air DOAS system?
A7.	<b>The owner opted for an indoor DOAS because, for security reasons, they did not want a unit sitting behind or at the back corner of the building. Additionally, the distance was also too far from the front to run refrigerant lines. A voluntary alternate would not be accepted as it would constitute a design change. Only Bidders may submit proposed "or-equal" items and such items must require no change in related Work.</b>

## Bidding Requirements

1. Delete and Replace the following section:

a. Instructions to Bidders - #1a.

All Bids will be opened and read aloud. No Bid may be withdrawn for a period of ninety **(90) days** after the Bid is opened. Bid security shall likewise continue for the same ninety **(90) days** unless earlier released by the City. The successful Bidder shall comply with all Bidding and contract requirements. Bids, once opened and read, may not be withdrawn without forfeiture of the Bid security.

**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: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex  
– Bid #2

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I am responsible for the following specifications and drawings:

Drawings:

G-0.00  
A-0.01  
A-0.02  
A-0.03  
A-1.01  
A-2.01  
A-2.02  
A-2.03  
A-3.01  
A-3.02  
A-3.03  
A-3.04  
A-3.05  
A-4.01  
A-4.02  
A-5.01  
A-5.02

Specifications:

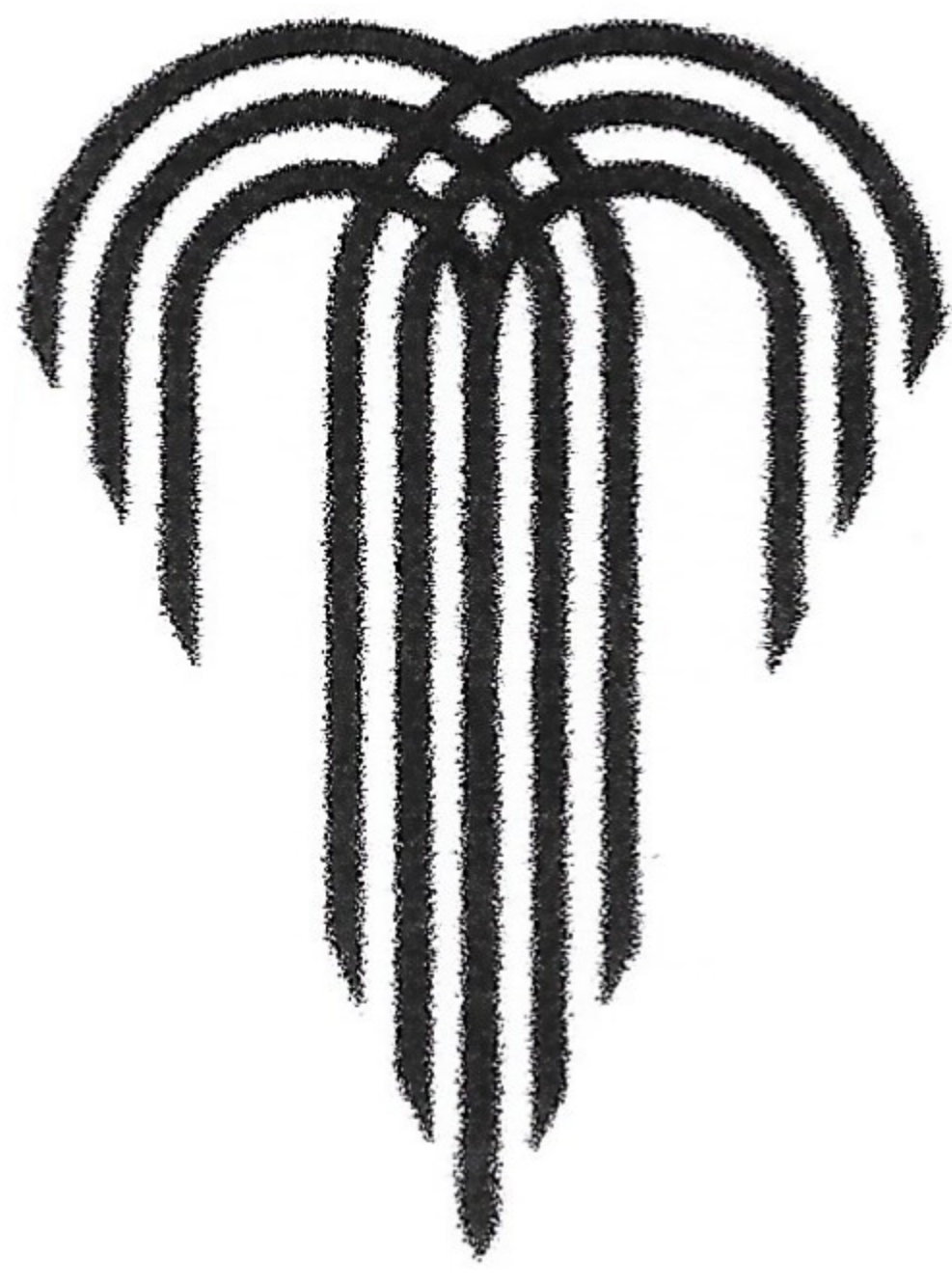
Division 2  
Division 3  
Divisions 5 through 10  
Division 12



\_\_\_\_\_  
(SEAL)

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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: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex  
– Bid #2

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I am responsible for the following specifications and drawings:

Drawings:

C-1.00

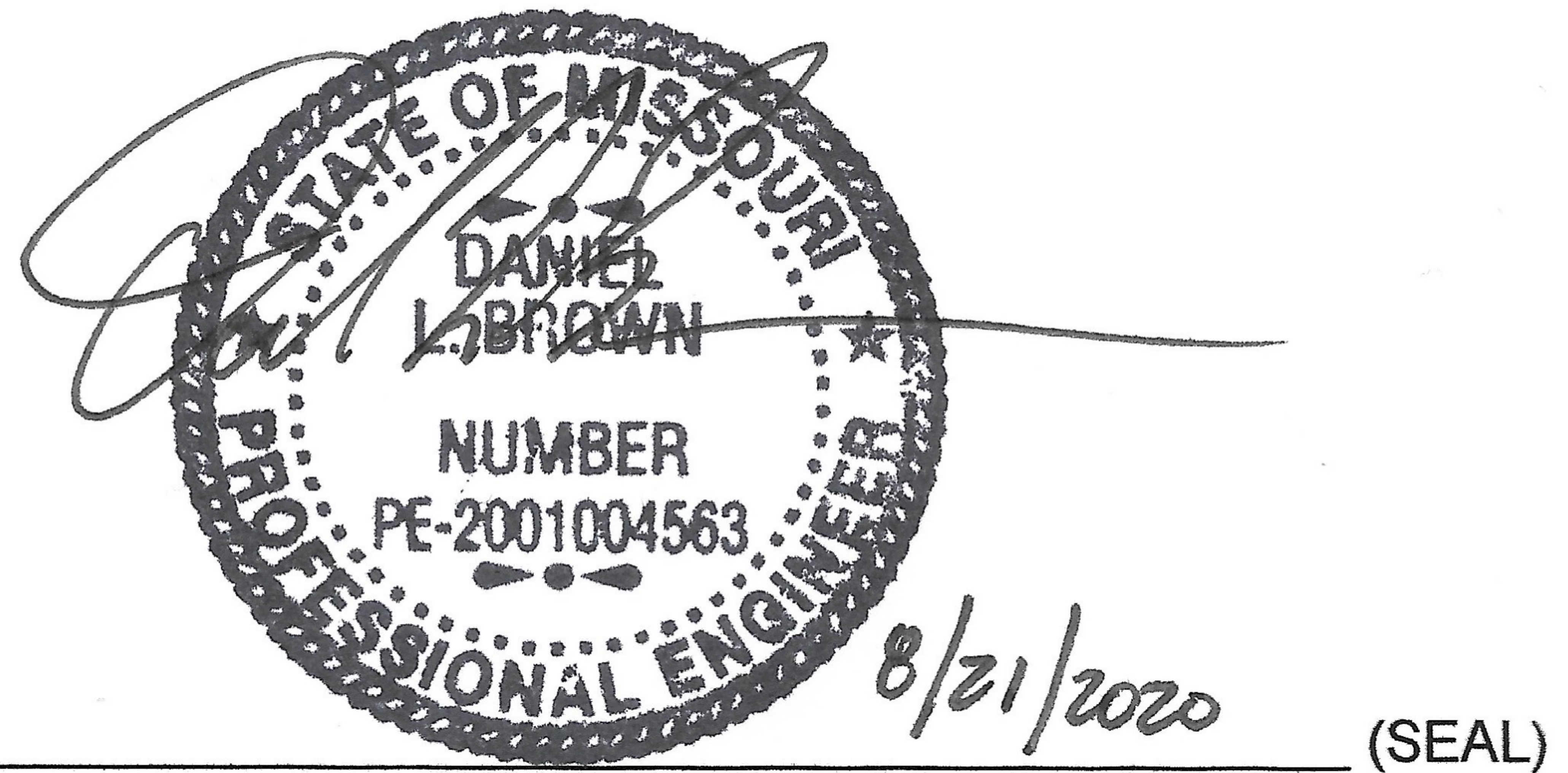
C-2.00

Specifications:

221113 – Facility Water Distribution Systems

Division 31

Division 32



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: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex  
– Bid #2

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I am responsible for the following specifications and drawings:

Drawings:  
FP-1.01

Specifications:  
Division 21



05/17/2021

(SEAL)

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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: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex  
– Bid #2

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I am responsible for the following specifications and drawings:

**Drawings:**

M-1.01,  
M-2.01,  
M-3.01, M-3.02, M-3.03, M-3.04, M-3.05,  
M-4.00, M-4.01,  
M-5.00, M-5.01,  
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P-2.01,  
P-3.01,  
P-4.01,  
P-5.01,  
E-1.01,  
E-2.01,  
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E-5.01, E-5.02, E-5.03, E-5.04, E-5.05,  
E-6.00, E-6.01,  
E-7.00, E-7.01, E-7.02, E-7.03, E-7.04, E-7.05, E-7.06, E-7.07

**Specifications:**

Division 22  
Division 23  
Division 26  
Division 28



5/17/2021

(SEAL)

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



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Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

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## LIST OF DRAWINGS

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex  
– Bid #2

Item	Set /Title /Description /Designation	Drawing No(s).	Dated
01	COVER SHEET	G-0.00	MAY 2020
02	CIVIL GENERAL LAYOUT	C-1.00	MAY 2020
03	CIVIL SITE UTILITY PLAN	C-2.00	MAY 2020
04	GENERAL INFORMATION	A-0.01	MAY 2020
05	CODE REVIEW & CODE PLAN	A-0.02	MAY 2020
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11	ENLARGED PLAN - AREA A	A-3.01	MAY 2020
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13	ENLARGED PLAN - AREA C	A-3.03	MAY 2020
14	ENLARGED PLAN - AREA D	A-3.04	MAY 2020
15	ENLARGED PLAN - AREA E	A-3.05	MAY 2020
16	ARCHITECTURAL DETAILS	A-4.01	MAY 2020
17	ARCHITECTURAL DETAILS	A-4.02	MAY 2020
18	EQUIPMENT SCHEDULE, DOOR SCHEDULE & DETAILS	A-5.01	MAY 2020
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23	ENLARGED PLAN-AREA B MECHANICAL	M-3.02	MAY 2020
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25	ENLARGED PLAN-AREA D MECHANICAL	M-3.04	MAY 2020
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30	MECHANICAL SCHEDULES	M-5.01	MAY 2020
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32	FLOOR PLAN - PLUMBING	P-2.01	MAY 2020
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37	FLOOR PLAN-ELECTRICAL DEMOLITION	E-1.01	MAY 2020
38	FLOOR PLAN-ELECTRICAL NEW WORK	E-2.01	MAY 2020
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40	ENLARGED PLAN-AREA B-POWER	E-3.02	MAY 2020
41	ENLARGED PLAN-AREA C-POWER	E-3.03	MAY 2020

42	ENLARGED PLAN-AREA D-POWER	E-3.04	MAY 2020
43	ENLARGED PLAN-AREA E-POWER	E-3.05	MAY 2020
44	ENLARGED PLAN-AREA A-LIGHTING	E-4.01	MAY 2020
45	ENLARGED PLAN-AREA B-LIGHTING	E-4.02	MAY 2020
46	ENLARGED PLAN-AREA C-LIGHTING	E-4.03	MAY 2020
47	ENLARGED PLAN-AREA D-LIGHTING	E-4.04	MAY 2020
48	ENLARGED PLAN-AREA E-LIGHTING	E-4.05	MAY 2020
49	ENLARGED PLAN-AREA A-POWER	E-5.01	MAY 2020
50	ENLARGED PLAN-AREA B-POWER	E-5.02	MAY 2020
51	ENLARGED PLAN-AREA C-POWER	E-5.03	MAY 2020
52	ENLARGED PLAN-AREA D-POWER	E-5.04	MAY 2020
53	ENLARGED PLAN-AREA E-POWER	E-5.05	MAY 2020
54	ELECTRICAL DETAILS	E-6.00	MAY 2020
55	ELECTRICAL DETAILS	E-6.01	MAY 2020
56	ELECTRICAL SCHEDULES	E-7.00	MAY 2020
57	ELECTRICAL SCHEDULES	E-7.01	MAY 2020
58	ELECTRICAL SCHEDULES	E-7.02	MAY 2020
59	ELECTRICAL SCHEDULES	E-7.03	MAY 2020
60	ELECTRICAL SCHEDULES	E-7.04	MAY 2020
61	ELECTRICAL SCHEDULES	E-7.05	MAY 2020
62	ELECTRICAL SCHEDULES	E-7.06	MAY 2020
63	ELECTRICAL SCHEDULES	E-7.07	MAY 2020





## INVITATION TO BID

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

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The General Services Department of Kansas City, Missouri will receive sealed Bids until **2:00 PM, on Tuesday, June 29, 2021** at 414 E. 12<sup>th</sup> Street, 1<sup>st</sup> Floor, Room 102W, Kansas City, MO 64106 for **Project/Contract Numbers: 81000812/1541 - Waste Water Treatment Building – Blue River Annex – Bid #2**. Bids will be opened after that time.

City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the performance of City contracts. The goals for this specific Project are **(15%) MBE** participation and **(10%) WBE** participation.

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

Bidders are requested to attend the **Pre-Bid Conference at 10:00 AM on Thursday, June 17, 2021**, virtually through Microsoft (MS) Teams. Bidders can also contact the project manager via email 48 hours ahead of the meeting and request the meeting invitation be forwarded to the attendees' email address.

## Microsoft Teams meeting

**Join on your computer or mobile app**

[Click here to join the meeting](#)

**Or call in (audio only)**

[+1 872-212-5076](tel:+18722125076), [871549929#](tel:+18722125076) United States, Chicago

Phone Conference ID: 871 549 929#

Project Manager: Bon Marie Gardner  
Phone Number: (816) 513-0354  
Fax Number: (816) 513-0288  
E-mail: [Bon.Marie.Gardner@kcmo.org](mailto:Bon.Marie.Gardner@kcmo.org)

Contract Administrator: Delois Moore  
Phone Number: 816-513-0807  
Fax Number: 816-513-2812  
E-mail: [delois.moore@kcmo.org](mailto:delois.moore@kcmo.org)

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



## INSTRUCTIONS TO BIDDERS

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

1. Sealed Bids for **Project/Contract Number: 81000812/1541 – Waste Water Treatment Building – Blue River Annex – Bid #2** will be received by the General Services Department at 414 E. 12<sup>th</sup> Street, 1<sup>st</sup> Floor, Room 102W, Kansas City, MO 64106 until **2:00 P.M., June 29, 2021** 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 one hundred twenty (120) days after the Bid is opened. Bid security shall likewise continue for the same one 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. Consideration of Bids

- 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. Alternates. If this solicitation includes Bid Alternates, the City, in its sole discretion, may include any, all or none of the Alternates in determining the lowest 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.

3. Evidence of Competency to Perform. Each bidder shall furnish with the bid satisfactory evidence of Bidder’s competency to perform the proposed work. Such evidence of competency shall consist of the following:

- a. Completed Form 00410.01 Experience Reference Summary for three projects of similar scope performed within the past 5 years including the name, address and telephone number of the contact person having knowledge of the project and the dollar value of the project.
- b. Statement that, during the three (3) years immediately preceding the date of the Bid, Bidder has received no written notices of violations of any federal or state prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or Bidder has been found in such but has made restitution to affected workmen and complied with any statutory penalty; and a statement

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

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

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

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

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

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

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

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

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

9. Mistake in Bid Security By submitting a Bid, Bidder is agreeing to correct any mistakes on a Bid security submission when requested by the City. When such a mistake occurs and a Bidder fails or refuses to correct the mistake or execute the Contract when requested by the City, any Bid security shall be forfeited to the City and the Bidder shall also be subject to debarment and damages.

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

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

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

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

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

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

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

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

Successful Bidder shall be required to use City's Internet web based Prevailing Wage Reporting System provided by City and protocols included in that software during the term of this Contract. When requested

by the City, Bidder shall submit user applications to City's provided Prevailing Wage Reporting System for all applicable personnel and shall require subcontractors to submit same.

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

19. MBE/WBE Program Requirements City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the performance of City contracts. The goals for this specific Project are (15%) MBE participation and (10%) 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 [www.kcmo.gov](http://www.kcmo.gov). 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. Waiver of MBE/WBE Requirements The City Council may waive any and all MBE/WBE requirements imposed by any Bidding Document or the MBE/WBE Ordinance and Contract with the lowest 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; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder being debarred and forfeiting its Bid Bond.

22. Workforce Program Requirements. City desires that minorities and women have a maximum opportunity to practice their trades on city construction projects. The minimum company-wide goals are a ten percent (10%) minority workforce and two percent (2%) women workforce. The City's 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 Subcontractor or Supplier in a prompt and fair manner. If the City is notified by a Subcontractor or Supplier of a contract claim with the successful Bidder, City will notify the successful Bidder and will request prompt resolution of the claim. City will provide any such Subcontractor or Supplier information regarding mandatory mediation as well as a copy of the Payment Bond. City may notify the Surety that City has taken cognizance of such claim.

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

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

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

24. Pre-Bid Conference The General Services Department will hold a pre-Bid conference on June 17th, 2021 at 10:00 AM virtually through Microsoft (MS) Teams. The MS Teams meeting can be accessed by contacting the Project Manager within 48 hours of the meeting and request the meeting invitation be forwarded to the attendees' email address. Attendance at the pre-Bid conference is encouraged for all Bidders on this Project.

## Microsoft Teams meeting

**Join on your computer or mobile app**

[Click here to join the meeting](#)

**Or call in (audio only)**

[+1 872-212-5076](tel:+18722125076),871549929# United States, Chicago

Phone Conference ID: 871 549 929#

25. On-Site Inspection The Project Site will be available for inspection by Bidders. Bidders visiting the Project Site shall be responsible for their own safety. The Project Site shall be available for inspection by appointment from 8 AM to 2 PM each day Monday through Friday (holidays excepted). Bidders may contact the following individual from the Water Services Department for an appointment.

Contact: Craig Daily

Phone: (816) 719-0471 / E-mail: [craig.daily@kcmo.org](mailto:craig.daily@kcmo.org)

26. On-Site Inspection The Project Site will be available for inspection by Bidders. Bidders visiting the Project Site shall be responsible for their own safety.

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

Limited Liability Company:

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

Partnership:

a partner authorized to sign on behalf of the partnership.

Sole Proprietor:

- the proprietor.

Joint Venture:

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

Corporation:

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

26. 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.

Bon Marie Gardner, Project Manager  
Water Services Department  
4800 E, 63rd Street  
Kansas City, MO 64130  
(816) 513-0354  
(816) 513-0288  
E-mail: [Bon.Marie.Gardner@kcmo.org](mailto:Bon.Marie.Gardner@kcmo.org)

Delois Moore, Procurement Manager  
General Services Department  
City Hall  
414 E. 12th Street  
1st Floor-Room 102W  
Kansas City, Missouri 64106  
(816) 513-0807  
(816) 513-2812 Fax  
E-mail: [delois.moore@kcmo.org](mailto:delois.moore@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.*

***[Specifier: Remember to review paragraph numbering.]***



CITY OF FOUNTAINS  
HEART OF THE NATION



KANSAS CITY  
MISSOURI

## BID FORM/CONTRACT

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex –Bid #2

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

**TOTAL BID IN NUMERIC FIGURES**

\$ \_\_\_\_\_

5. The undersigned Bidder has given CITY'S Project Manager written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the Project Manager or by the DESIGN PROFESSIONAL is acceptable to Bidder.
6. The undersigned Bidder agrees that this Bid shall remain subject to selection by CITY, and may not be withdrawn for one 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 00412 Unit Prices 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.

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

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

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

11. By submitting its bid, Bidder is agreeing to meet or exceed the minimum employment goals of 10% minority and 2% women during the term of its contract with the City, or request a waiver of the goals. If a waiver is requested, Bidder must establish good faith efforts towards meeting the goals as set forth in the 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.

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

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:**                        15   % MBE      10   % WBE    \_\_\_\_\_ % DBE

**BIDDER PARTICIPATION:**                      \_\_\_\_\_ % MBE    \_\_\_\_\_ % WBE    \_\_\_\_\_ % DBE

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

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

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

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

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

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

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

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

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

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: \_\_\_\_\_

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

**ACCEPTANCE OF BID**

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

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

The Contract Price includes:

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

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

Alternate No. 1 - Provide new 120V motorized damper actuator and interlock with existing ventilation fans as shown on M-2.01, M-3.01, and M-3.05 \$

Alternate No. 2 – Achieving Substantial Completion within 105 days from Notice to Proceed. \$

Alternate No. 3 – Hold bid pricing for 120 days \$

Alternate No. 4 – Hold bid pricing for 150 days \$

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: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

<b>Firm's Legal Name</b>	
<b>Mailing Address</b>	
<b>Contact – Name &amp; Email</b>	
<b>Contact – Phone &amp; Fax</b>	

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

CITY OF FOUNTAINS  
HEART OF THE NATION



KANSAS CITY  
MISSOURI

## UNIT PRICES

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building - Blue River Annex - Bid #2

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

Item No.	Unit	Quantity	Item Description:	Unit	Extension
1	Square Foot		<b>Moisture Vapor Transmission Coating System under the "Resilient Tile Flooring" Spec. Section 096519 and the "Resinous Flooring" Spec. Section 096723 -</b> Apply moisture vapor transmission coating in manufacturer's recommended thickness where testing shows moisture-vapor emissions are not within acceptable levels.		
2	Lineal Foot		<b>Reinforcing membrane -</b> Apply reinforcing membrane to cracks in floor slab to the extent determined after shot blasting slab according to Spec. Section 096723 "Resinous Flooring".		
			Total Unit Prices:		TOTAL \$

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





## ALTERNATES

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

Page 1 of 1

No: 1	Description: Provide new 120V motorized damper actuator and interlock with existing ventilation fans as shown on M-2.01, M-3.01 and M-3.05.	<input type="checkbox"/> Add [+] <input type="checkbox"/> Deduct [-]	Price in Figures:  \$
2	Achieving Substantial Completion within 105 days from Notice to Proceed.	<input type="checkbox"/> Add [+] <input type="checkbox"/> Deduct [-]	Price in Figures:  \$
3	Hold bid pricing for 120 days	<input type="checkbox"/> Add [+] <input type="checkbox"/> Deduct [-]	Price in Figures:  \$
4	Hold bid pricing for 150 days	<input type="checkbox"/> Add [+] <input type="checkbox"/> Deduct [-]	Price in Figures:  \$



## BID BOND

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

Bond Number \_\_\_\_\_

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

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

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

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

Signed, sealed and delivered this \_\_\_\_\_ day of \_\_\_\_\_.

### BIDDER AND PRINCIPAL

Name, address and facsimile number of Bidder and Principal

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

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

(Attach corporate seal if applicable)

**SURETY**

Name, address and facsimile number of Surety:

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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)

**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](http://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.**
- 4.

#### **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

Any other information deemed relevant by the bidder, proposer, contractor or developer, as applicable, or the director to the extent the director provides written direction to the bidder, proposer, contractor or developer of such additional information at the time the goals are recommended by the director. 8. Within five (5) working days after drawing the bid specifications, 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 more than 800 construction labor hours, (2) has estimated costs that exceed \$300,000.00, and (3) involve the expenditure of public funds.
- D. The successful bidder may meet company-wide goals by counting the bidder's utilization of minorities and women throughout the Kansas City metropolitan statistical area. . In addition, the successful Bidder is responsible to ensure that it and its subcontractors cumulatively make good faith efforts to meet project-specific goals for utilization of minorities and women.
- E. These 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 documentation of good faith efforts and grant or deny a waiver or modification. The Director will grant a waiver or modification only if the Bidder has made good faith efforts to secure minority and female participation.

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

- B. In evaluating good faith efforts, the Director will consider whether the Bidder and its subcontractors have performed the following:
  1. For those bidders that are not signatories to a collective bargaining agreement with organized labor:
    - a. Requested in writing the assistance of the Director with respect to efforts to promote the utilization of minorities and women in the workforce and acted upon the Director's recommendations; and
    - b. Advertised in minority or women trade association newsletters and/or minority or women owned media at least 15 calendar days prior to the utilization of any construction services on the city construction contract and used terminology that sufficiently describes the work available, the pay scale,

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

bargaining agreement, the bidder shall substitute other procedures as may be approved by the Director in writing, in order to accomplish the purpose and intent of this section.

- C. In the event workforce goals are not met or there is anticipation that goals will not be met, a Bidder will be required to give the City documentation to prove that it and/or its subcontractors made good faith efforts. The Bidder will be contacted by the City with further instructions about when this documentation must be submitted.

#### **V. Access to Documents and Records.**

- A. By submitting a Bid, each Bidder agrees to permit the City, its duly authorized agents or employees, access at all reasonable times to all books and business records of Bidder as may be necessary to ascertain compliance with the requirements of this document and the Program, within ten (10) days of the date of the written request. Each bidder further agrees to require, if awarded the contract, that every subcontractor permit the City the same access to documents and records.
- B. All Bidders agree to cooperate with the contracting department and 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](http://www.feckc.org) and clicking on the link for KCMO First Source Hiring Program. The contractor shall not hire any individual to provide construction services on a City construction contract unless the contractor has met the requirements of the First Source Program.
- C. The contractor shall require that its subcontractors utilize the First Source Program to the same extent that the contractor is required to do so, and shall incorporate the requirements of this Section IX into every subcontract. Every subcontractor shall be required to contact the Full Employment Council within 48 hours of subcontract award, regardless of whether the subcontractor has any hiring needs at that time, and within 48 hours following any job vacancy which the subcontractor reasonably anticipates filling during the term of their subcontract on a City construction project.



# CONTRACTOR UTILIZATION PLAN/REQUEST FOR WAIVER

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

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

\_\_\_\_\_  
(Department Project)

\_\_\_\_\_  
Department

\_\_\_\_\_  
(Bidder/Proposer)

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

) ss

COUNTY OF \_\_\_\_\_ )

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

1. This Affidavit is made for the purpose of complying with the provisions of the MBE/WBE submittal requirements on the above project and the MBE/WBE Program and is given on behalf of the Bidder/Proposer listed below. It sets out the Bidder/Proposer's plan to utilize MBE and/or WBE contractors on the project.
2. The project goals are \_\_\_\_\_ % **MBE** and \_\_\_\_\_ % **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. \_\_\_\_\_
  
- d. Name of M/WBE Firm \_\_\_\_\_  
 Address \_\_\_\_\_  
 Telephone No. \_\_\_\_\_  
 I.R.S. No. \_\_\_\_\_
  
- e. Name of M/WBE Firm \_\_\_\_\_  
 Address \_\_\_\_\_  
 Telephone No. \_\_\_\_\_  
 I.R.S. No. \_\_\_\_\_
  
- f. Name of M/WBE Firm \_\_\_\_\_  
 Address \_\_\_\_\_  
 Telephone No. \_\_\_\_\_  
 I.R.S. No. \_\_\_\_\_

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

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

**MBE/WBE BREAKDOWN SHEET**

**MBE FIRMS:**

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


**TOTAL MBE \$ / TOTAL MBE %:** \$ \_\_\_\_\_ %

**WBE FIRMS:**

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

**TOTAL WBE \$ / TOTAL WBE %:** \$ \_\_\_\_\_ %

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

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

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

contract amount may correspondingly increase the amount of compensation due an M/WBE for purposes of meeting or exceeding the Bidder/Proposer participation

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

Bidder/Proposer primary contact: \_\_\_\_\_

Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Facsimile number: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

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

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

Date: \_\_\_\_\_

(Attach corporate seal if applicable)

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

My Commission Expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public



# LETTER OF INTENT TO SUBCONTRACT

Select one:
Original LOI:
Updated LOI:

Project Name/Title \_\_\_\_\_

Project Location/Number \_\_\_\_\_

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

(1) Company name: \_\_\_\_\_

Full address: \_\_\_\_\_

Street number and name

City, State and Zip Code

Primary contact: \_\_\_\_\_

Name

Phone

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

b) Scope of work to be performed: \_\_\_\_\_

c) The dollar value of this agreement is: \_\_\_\_\_







# 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 applicable)** \_\_\_\_\_

<b>Project Goals:</b>	_____ % MBE	_____ % WBE
<b>Contractor Utilization Plan:</b>	_____ % MBE	_____ % WBE

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

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

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

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

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

**TO**

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

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

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



- \_\_\_ The MBE/WBE listed on the Contractor Utilization Plan is non-responsive or cannot perform.
- \_\_\_ The MBE/WBE listed on the Contractor Utilization Plan has increased its previously quoted price without a corresponding change in the scope of work.
- \_\_\_ The MBE/WBE listed on the Contractor Utilization Plan has committed a material default or breach of its contract.
- \_\_\_ Requirements of the scope of work of the contract have changed and make subcontracting not feasible or not feasible at the levels required by the goals established for the contract.
- \_\_\_ The MBE/WBE listed on the Contractor Utilization Plan is unacceptable to the City contracting department.
- \_\_\_ Bidder/Contractor/Proposer has not attempted intentionally to evade the requirements of the Act and it is in the best interests of the City to allow a modification or substitution.

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

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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  
Construction Contractor Employee Identification Report**

Company Name: \_\_\_\_\_  
 Company Address: \_\_\_\_\_  
 Company City, State, Zip: \_\_\_\_\_

Prime's Name: \_\_\_\_\_  
 KCMO Project Name: \_\_\_\_\_  
 KCMO Project Number: \_\_\_\_\_

Name of Person Completing Report: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Email: \_\_\_\_\_

Today's Date: \_\_\_\_\_  
 City Department: \_\_\_\_\_

**Instructions:**

- 1) Each applicable Prime Contractors **must complete this form for its company within 48 hours of bid opening**
- 2) The Human Relations Department strongly recommends usage of the electronic version of this form. This form may be obtained by visiting [www.kcmo.gov](http://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**.
- 5) Complete this form with data from your **current construction workforce** (no office personnel).
- 6) Prime contractor is responsible to ensure subcontractor completes this form as required in #3 above.

KCMO Resident		KCMO Resident		Journeyman	Apprentice	Journeyman	Apprentice
Females		Males					
African American	0 0	African American	0 0	Foreman/Supervisor	0 --	Operating Engineer	0 0
Asian/Pacific Islander American	0 0	Asian/Pacific Islander American	0 0	Asbestos Worker	0 0	Painter	0 0
Caucasian American	0 0	Caucasian American	0 0	Boilermaker	0 0	Pipe Fitter/Plumber	0 0
Hispanic/Latino American	0 0	Hispanic/Latino American	0 0	Bricklayer	0 0	Plasterer	0 0
Native American	0 0	Native American	0 0	Carpenter	0 0	Roofer	0 0
Other	0 0	Other	0 0	Cement Mason	0 0	Sheet Metal	0 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 0		

Company Name: 0 KCMO Project Name: 0 KCMO Project Number: 0

	Name		Job Title (use drop down menu)	Address	City	State	Zip Code	KCMO Resident	Gender	Ethnicity
	Last	First								
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	Name		Job Title <i>(use drop down menu )</i>	Address	City	State	Zip Code	KCMO Resident	Gender	Ethnicity
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	Name		Job Title <i>(use drop down menu )</i>	Address	City	State	Zip Code	KCMO Resident	Gender	Ethnicity
	Last	First								
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## AFFIDAVIT OF TRAINING PROGRAM

*This form must be submitted with 48 hours of Bid Opening*

Bidder \_\_\_\_\_

Project/Contract Numbers and Title: 81000812/1541 - Waste Water Treatment Building – Blue River Annex – Bid #2

STATE OF MISSOURI             )  
   ) ss:  
COUNTY OF \_\_\_\_\_ )

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

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ (attach additional pages, if necessary)

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

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

\_\_\_\_\_ of \_\_\_\_\_  
(Title) (Name of Bidder)

Dated: \_\_\_\_\_ By: \_\_\_\_\_  
(Affiant)

Subscribed and sworn to before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

My Commission Expires: \_\_\_\_\_  
\_\_\_\_\_  
Notary Public



## Pre Contract Bidder's Certification

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

STATE OF \_\_\_\_\_ )  
 ) SS  
COUNTY OF \_\_\_\_\_ )

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

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

- A. Bidder is current on payment of its Federal and State Income tax withholding and unemployment insurance payments, either in Missouri for companies doing business in Missouri, or in the state in which Bidder has its principal office; and
- B. Bidder declares one of the following, regarding all work performed two (2) years immediately preceding the date of the Bid (check one):
  - Contract by contract listing of all of Bidder's written notices of violations of any Federal or State prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or paid by the Bidder (Complete and attach additional sheets if necessary):
    1. \_\_\_\_\_
    2. \_\_\_\_\_
    3. \_\_\_\_\_
  - There have been no written notices of violations of any Federal or State prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or paid by the Bidder.
- C. Bidder is currently in good standing with the Missouri Secretary of State or Bidder has filed a Registration of Fictitious Name with the Missouri Secretary of State.

\_\_\_\_\_  
(Bidder's Name)

\_\_\_\_\_  
(Date)

Signature of Person Making This Affidavit

In witness whereof, I have hereunto subscribed my name and affixed my official seal this \_\_\_ day of \_\_\_\_\_, 20\_\_.



## CONTRACT REQUIRED SUBMISSIONS

**Project/Contract Numbers:** 81000812/1541

**Project Title:** Waste Water Treatment Building – Blue River Annex – Bid #2

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

### **MISSOURI SECRETARY OF STATE BUSINESS ENTITY REGISTRATION**

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

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

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

### **SUBCONTRACTORS LISTING** [Applicable form provided]

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

### **PAYMENT BONDS (If applicable)**

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

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

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

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

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

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

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



**PERFORMANCE AND MAINTENANCE BOND (If applicable)**

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

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

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

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

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

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

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

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

- Provide a certificate of insurance for all insurance that may be required in the contract such as:

- Commercial General Liability
- Workers' Compensation and Employers' Liability
- Commercial Automobile Liability
- Railroad Protective Liability
- Environmental Liability
- Asbestos Liability
- Longshoremen's Insurance
- Property Insurance

- List the NAIC Number (National Association of Insurance Commissioners) or A.M. Best Number for each Insurer listed on the Certificate of Insurance.
- Certificate "Kansas City, Missouri" must named as an Additional Insured.
- Check the insurance requirements of the Contract. If Contract Documents require that other entities be included as additional insureds, each entity shall be listed on the certificate(s).
- Description of Operations must include Project/Contract Number and Project/Contract Title/Description as contained in the Contract Documents. The Certificate Holder and address block shall be completed as follows:
  - Kansas City, Missouri
  - [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 \_\_\_\_\_ )

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

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

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

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

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

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

\_\_\_\_\_  
Affiant's signature

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Notary Public

My Commission expires:



MISSOURI DEPARTMENT OF REVENUE  
 CUSTOMER SERVICES DIVISION  
**PROJECT EXEMPTION CERTIFICATE**

FORM  
**5060**  
 (REV. 1-2008)

**TO BE GIVEN TO  
 YOUR CONTRACTOR**

NAME OF EXEMPT ENTITY ISSUING THE CERTIFICATE		MISSOURI TAX EXEMPTION NUMBER	
ADDRESS		CITY	STATE ZIP
BEGIN DATE FOR PROJECT	PROJECTED COMPLETION DATE	PROJECT NUMBER	
DESCRIPTION OF PROJECT			
PROJECT LOCATION		EXPIRATION DATE	
<p><b>THIS EXEMPTION DOES NOT APPLY TO THE PURCHASE OR RENTAL OF MACHINERY, EQUIPMENT, OR TOOLS BY THE CONTRACTOR OR SUB-CONTRACTOR.</b></p> <p><b>Give a signed copy of this certificate, along with a copy of your Missouri Sales/Use Tax Exemption Letter to each contractor and/or subcontractor who will be purchasing tangible personal property for use in this project. It is your responsibility to ensure the validity of the certificate. You must issue a new certificate if any of the information changes.</b></p>			
EXEMPT ENTITY'S AUTHORIZED SIGNATURE		DATE	
<p>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 Section 144.062, RSMo. I also declare under penalties of perjury that I employ no illegal or unauthorized aliens as defined under federal law and that I am not eligible for any tax exemption, credit or abatement if I employ such aliens.</p>			
NAME OF PURCHASING CONTRACTOR			
ADDRESS		CITY	STATE ZIP
<p><b>Contractors present this to your supplier in order to purchase the necessary materials tax exempt.</b></p> <p><b>NOTE: COMPLETE AND SIGN BOTTOM PORTION IF EXTENDING CERTIFICATE TO YOUR SUBCONTRACTOR.</b></p>			
NAME OF PURCHASING SUBCONTRACTOR			
ADDRESS		CITY	STATE ZIP
SIGNATURE OF CONTRACTOR		DATE	

# State of Missouri

## EXEMPTION FROM MISSOURI SALES AND USE TAX ON PURCHASES

Issued to:

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

Missouri Tax ID  
Number: 12490466

Effective Date:  
07/11/2002

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

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

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

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

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

Any alteration to this exemption letter renders it invalid.

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



# PERFORMANCE AND MAINTENANCE BOND

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

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

WHEREAS,

CONTRACTOR has entered into a Contract with OWNER for \_\_\_\_\_ which Contract, including any present or future amendment thereto, is incorporated herein by reference and is hereinafter referred to as the Contract.

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

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

IN WITNESS WHEREOF, the above parties have executed this instrument the \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**CONTRACTOR**

Name, address and facsimile number of Contractor

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

(Attach corporate seal if applicable)

**SURETY**

Name, address and facsimile number of Surety:

---

---

---

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

By: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

(Attach seal and Power of Attorney)





## PAYMENT BOND

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

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

WHEREAS,

CONTRACTOR has entered into a contract with OWNER for \_\_\_\_\_, which Contract, including any present or future amendment thereto, is incorporated herein by reference and is hereinafter referred to as the Contract.

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

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

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

While this Bond is in force, it may be sued on at the instance of any party to whom any such payment is due, in the name of OWNER to the use for such party. OWNER shall not be liable for the payment of any costs or expenses of any such suit.

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

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

IN WITNESS WHEREOF, the above parties have executed this instrument the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

**CONTRACTOR**

Name, address and facsimile number of Contractor

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

(Attach corporate seal if applicable)

**SURETY**

Name, address and facsimile number of Surety:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

By: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

(Attach seal and Power of Attorney)



# CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

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

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

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

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

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

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

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

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

**CERTIFICATE HOLDER**                      **CANCELLATION**

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

Revenue Division  
414 East 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 City, Missouri, Finance Department, Revenue Division, to release a Revenue Clearance Letter for:

Name of Taxpayer: \_\_\_\_\_ Tax I.D.# \_\_\_\_\_  
*(PRINT)*

Address: \_\_\_\_\_

**Check this box and the City will send the Clearance Letter to you or the contractor designated.**

I authorize the City to provide a copy of the Taxpayer's Revenue Clearance Letter to the following:

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

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

Please send my 1<sup>st</sup> Revenue Clearance Letter to: \_\_\_\_\_  
*(Print Name of City Department/Contact Person/E-mail/Fax Number)*

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

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

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

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

NAME <i>(PRINT)</i>	TITLE <i>(IF APPLICABLE)</i>	
SIGNATURE	PHONE NUMBER	DATE

**A FACSIMILE OF THIS DOCUMENT SHALL CONSTITUTE AN ORIGINAL**



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## ARTICLE 1 DEFINITIONS AND TERMINOLOGY

### 1.01 Defined Terms

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**20. Day-** Shall constitute a Calendar Day.

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

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

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

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

**24. Drawings-** The drawings which graphically show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared

by DESIGN PROFESSIONAL and are included in the Contract Documents. Shop Drawings are not Drawings as so defined.

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

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

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

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

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

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

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

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

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

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

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

**36. PCBs-** Polychlorinated biphenyls.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**53. Work Day -** Any day during which the CONTRACTOR is able to work a period of six (6) hours or more. Days that are not Work Days are days during which the CONTRACTOR is

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

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

## **1.02 Terminology**

### **A. Intent of Certain Terms or Adjectives**

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

### **B. Defective**

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

### **C. Furnish, Install, Perform, Provide**

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

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

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

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

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

## ARTICLE 2 PRELIMINARY MATTERS

### 2.01 Delivery of Bonds

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

### 2.02 Evidence of Insurance

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

### 2.03 Copies of Documents

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

### 2.04 Commencement of Contract Times; Notice to Proceed

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

### 2.05 Starting the Work

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

### 2.06 Before Starting Construction

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

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

1. Preliminary Project Schedule: CONTRACTOR shall submit a proposed project schedule for CITY's acceptance. The proposed project schedule shall include a detailed and comprehensive construction schedule utilizing a critical path method diagram network that (a) shows all major procurement and construction elements and phases of the Project; (b) breaks down each element or phase by trade; (c) shows early and late starts so that all float time will be accurately identified; (d) all other activities necessary for the timely completion of the Project in accordance with the scheduled dates for Substantial and Final Completion; and (e) highlights the project's critical path. CITY's acceptance is expressly limited to CITY's acknowledgement that, based upon CITY's limited review, the dates of Substantial Completion and Milestone dates are acceptable. After final acceptance of the preliminary project schedule by the CITY, it shall be considered the project baseline schedule pursuant to Paragraph 2.07(B).

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

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

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

## **2.07 Acceptable Schedules**

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

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

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

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

## **ARTICLE 3 CONTRACT DOCUMENTS : INTENT, AMENDING, REUSE**

### **3.01 Intent**

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

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

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

1. Change Orders and Written Amendments
2. Project Baseline Schedule Requirements
3. Approved Shop Drawings
4. Addenda, with those of later date having precedence over those of earlier date

5. The Supplementary Conditions
6. The General Conditions
7. Drawings and Specifications

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

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

### **3.02 Reference to Standards and Specifications of Technical Societies**

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

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

### **3.03 Reporting and Resolving Discrepancies**

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

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

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



### **3.04 Amending and Supplementing Contract Documents**

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

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

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

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

### **3.05 Reuse of Documents**

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

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

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

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

### **4.01 Availability of Lands**

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

### **4.02 Subsurface and Physical Conditions**

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

1. Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents; and

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

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

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

3. any CONTRACTOR interpretation of or conclusion drawn from any technical data or any such other data, interpretations, opinions or information.

#### **4.03 Differing Subsurface or Physical Conditions**

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

1. is of such a nature as to establish that any technical data on which CONTRACTOR is entitled to rely as provided in Paragraphs 4.02 A and 4.02 B is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.17), notify CITY and DESIGN PROFESSIONAL in writing about such condition(s). CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

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

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

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

1. the condition must meet any one or more of the categories described in Paragraphs 4.03 A.1 through 4.03 A.4, inclusive;

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

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

#### **4.04. Physical Conditions – Underground Facilities**

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

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

**B. Not Shown or Indicated:** If an Underground Facility is uncovered or revealed at or contiguous to the Site, and was not shown or indicated in the Contract Documents, or was shown or indicated incorrectly in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.17), identify the owner of such Underground Facility and give written notice to that owner and to CITY and DESIGN PROFESSIONAL.

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

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

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

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

**F.** If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price pursuant to Article 11 and/or Contract Times pursuant 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.

#### **4.05 Reference Points**

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

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

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

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

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

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

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

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

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

1. specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or
2. specifying any special conditions under which such Work may be resumed safely. If CITY and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price pursuant to Article 11 and/or Contract Times to pursuant to Article 12 as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, a Claim may be made therefore as provided in Article 16.

**F.** If after receipt of written notice as required in Paragraph 4.06 E, CONTRACTOR does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under special conditions specified in the notice, then CITY may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If CITY and CONTRACTOR cannot agree as to entitlement to or magnitude of an equitable adjustment in Contract Price pursuant to Article 11 and/or Contract Times pursuant to Article 12 as a result of

deleting such portion of the Work, then a Claim may be made therefore as provided in Article 16. CITY may have such deleted portion of the Work performed by CITY's own forces or others in accordance with Article 7.

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

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

## **ARTICLE 5 BONDS AND INSURANCE**

### **5.01 Performance, Payment and Other Bonds**

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

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

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

### **5.02 Licensed Sureties and Insurers**

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

### **5.03 Certificates of Insurance**

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

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

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

#### **5.04 CONTRACTOR's Liability Insurance**

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

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

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

1. with respect to insurance required by Paragraphs 5.04 A.3 through 5.04 A.5 inclusive, include as additional insureds (subject to any customary exclusion for professional liability) CITY, DESIGN PROFESSIONAL, Consultants and any other individuals or entities identified in the Supplementary Conditions to be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
2. include at least the specific coverages and be written for not less than the limits of liability provided in Paragraph 5.04 C or required by Laws or Regulations, whichever is greater;
3. include completed operations insurance;
4. include contractual liability insurance covering CONTRACTOR's indemnity obligations;
5. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing defective Work in accordance with Paragraphs 13.06 and 13.07;
6. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two (2) years after final payment (and CONTRACTOR shall furnish CITY and each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued evidence satisfactory to CITY and any such additional insured of continuation of such insurance);
7. contain a cross-liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance;
8. with respect to commercial automobile liability, commercial general liability, and umbrella liability insurance, CONTRACTOR shall require its insurance carrier(s) to waive all

rights of subrogation against CITY, and CITY's officers, directors, partners, employees and agents; and

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

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

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

Workers' Compensation: Statutory

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

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

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

3. Commercial General Liability Insurance. This insurance shall be occurrence type written in comprehensive form acceptable to CITY. This insurance shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include coverage for personal injury liability; contractual liability; completed operations and products liability; and for blasting, explosion, and collapse of buildings; and damage to underground property. The liability limits for bodily injury and property damage shall be not less than:

\$2,000,000 combined single limit for each occurrence

\$2,000,000 general aggregate.

4. The insurer's costs of providing the insureds a defense and appeal as additional insureds, including attorney's fees, shall be supplementary and shall not be included as part of the policy limits but shall remain the insurer's separate responsibility.

## **5.05 CITY's Liability Insurance**

**A.** In addition to the insurance required to be provided by CONTRACTOR under Paragraph 5.04, CITY, at CITY's option, may purchase and maintain at CITY's expense liability insurance that will protect CITY against claims which may arise from operations under the Contract Documents.

## **5.06 Property Insurance**

**A.** Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance on the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws or Regulations). This insurance shall:

1. include the interests of CITY, CONTRACTOR, Subcontractors, and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;



2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, tornado, collapse, debris removal, demolition occasioned by enforcement of Laws or Regulations, water damage, damage caused by frost and freezing, and acts of God;

3. be maintained in effect until final payment is made unless otherwise agreed to in writing by CITY with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.

**B.** CITY shall not be responsible for purchasing and maintaining any property insurance to protect the interests of CONTRACTOR, Subcontractors or others involved in the Work to the extent of any deductible amounts. The risk of loss within the deductible amounts will be borne by CONTRACTOR, Subcontractor or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

### **5.07 Waiver of Rights**

**A.** CITY and CONTRACTOR intend that all policies purchased in accordance with Paragraphs 5.04 and 5.06 will protect CITY, CONTRACTOR, DESIGN PROFESSIONAL Consultants, Subcontractors, and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. CITY and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work, but only to the extent of insurance coverage; and, in addition, waive all such rights against DESIGN PROFESSIONAL, Consultants, Subcontractors, and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of any and each of them) under such policies for losses and damages so caused and covered by insurance. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by CITY as trustee or otherwise payable under any policy so issued. None of the above waivers shall apply if specifically in conflict with Laws and Regulations.

### **5.08 Receipt and Application of Insurance Proceeds**

**A.** Any insured loss under the property insurance will be adjusted with CITY and made payable to CITY as fiduciary for the insureds, as their interests may appear, subject to the requirements of any indentures of indebtedness entered into by CITY.

**B.** CITY as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object to CITY's exercise of this power in writing within fifteen (15) days after the occurrence of loss. If such objection is made, CITY as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, CITY as fiduciary shall adjust and settle the loss with the insurers.

### **5.09 Partial Utilization – Property Insurance**

**A.** If CITY finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with Paragraph 14.05; provided that no such use or occupancy shall commence

before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

## **ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES**

### **6.01 Indemnification**

**A.** For purposes of this Paragraph 6.01 only, the following terms shall have the meanings listed:

1. Claims means all claims, damages, liability, losses, costs and expenses, including court costs and reasonable attorneys' fees, including attorney's fees incurred by the City in the enforcement of this indemnity obligation.

2. CONTRACTOR'S Agents means CONTRACTOR's officers, employees, sub-consultants, subcontractors, successors, assigns, invitees, and other agents.

3. CITY means CITY, its Program Manager/Construction Advisor and any of their agents, officials, officers, employees and program managers or construction advisors.

**B.** CONTRACTOR's obligations under this Paragraph with respect to indemnification for acts or omissions, including negligence, of CITY, shall be limited to the coverage and limits of insurance that CONTRACTOR is required to procure and maintain under this Contract. CONTRACTOR affirms that it has had the opportunity to recover the costs of the liability insurance required in this Contract in its contract price.

**C.** CONTRACTOR shall defend, indemnify and hold harmless CITY from and against all Claims arising out of or resulting from all acts or omissions in connection with this Contract caused in whole or in part by CONTRACTOR or CONTRACTOR's Agents, regardless of whether or not caused in part by any act or omission, including negligence, of OWNER.

**D.** In any and all Claims against CITY, DESIGN PROFESSIONAL, CONSULTANT, or any of their respective agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.01 C shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

**E.** The indemnification obligations of CONTRACTOR under Paragraph 6.01 C shall not extend to liability arising out of, resulting from, or caused by the professional negligence, errors or omissions of DESIGN PROFESSIONAL, CONSULTANT, or any of their respective agents, officers, directors or employees.

### **6.02 Supervision and Superintendence**

**A.** CONTRACTOR shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

**B.** At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent of the Work, who shall not be replaced without written request to and approval by CITY except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

**C.** If it is determined to be in the best interest of the Work, CONTRACTOR shall replace the project manager, resident superintendent or any other employee of the CONTRACTOR, Subcontractors, Suppliers or other persons or organizations performing or furnishing any of the Work on the project upon written request by the CITY.

### **6.03 Services, Working Hours, Labor, Materials and Equipment**

**A.** CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out and construct or perform the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the Site shall be performed during regular working hours. CONTRACTOR shall not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without CITY's written consent given after prior written notice to DESIGN PROFESSIONAL.

**B.** Unless otherwise specified in Division 1, General Requirements, CONTRACTOR shall furnish and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

**C.** All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of CITY. If required by DESIGN PROFESSIONAL, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

**D.** It is the policy of the CITY that any manufactured goods or commodities used or supplied in the performance of this Contract and any subcontract hereto shall be manufactured or produced in the United States whenever possible.

### **6.04 Progress Schedule**

**A.** CONTRACTOR shall adhere to the progress schedule established in accordance with Article 2 as it may be adjusted from time to time as provided below:

1. CONTRACTOR shall provide, at least once every thirty (30) calendar days, updated information on the project schedule, including thirty (30) day look ahead schedules, projected variances per event category and per Subcontractor, identification of all variances and calculation of the number of Days difference between the as-built critical path and the project schedule critical path

2. CONTRACTOR shall, with each application for payment, provide completed monthly updated status report for the previous month on the project schedule and updated information indicating as-built and as-planned conditions. The updated information on the project schedule shall not modify any Milestone dates in the project schedule that CITY has previously approved. The updated information required is a condition precedent to payment pursuant to paragraph 14.02 and shall include at a minimum:

- a. a concise statement of the outlook for meeting project schedule dates and the reasons for any change in outlook from the previous report;
- b. a review of any significant technical problems encountered during the month;
- c. an explanation of any corrective action taken or proposed; and
- d. a summary of any Claims anticipated by CONTRACTOR with respect to the Work, including the anticipated costs and schedule impacts of any such Claims.

## **6.05 Recovery Schedules**

### **A. If the CONTRACTOR should:**

1. fail, refuse or neglect to supply a sufficient number of workers or to deliver the materials or equipment with such promptness as to prevent the delay in the progress of the Work;
2. fail in any respect to commence and diligently prosecute the Work in accordance with the approved baseline project schedule in order to achieve substantial completion;
3. fail to commence, prosecute, finish, deliver or install the different portions of the Work on time as specified in the approved baseline project schedule; or
4. fail in the performance of any of the material covenants of the Contract Documents;

CITY shall have the right to direct the CONTRACTOR, upon seven (7) calendar days notice, to prepare a written recovery plan, for CITY's approval, to accelerate the Work in order to conform to the approved baseline project schedule, including, without limitation, providing additional labor or expediting delivery of materials, performing overtime or re-sequencing the Work without adjustments to the Contract value. Upon CITY's approval of the recovery plan, CONTRACTOR shall accelerate the Work in accordance with the plan.

**B.** Proposed recovery schedules shall be submitted to the CITY as a separate project plan for review and approval by CITY prior to incorporation into the approved baseline schedule. The recovery schedule shall be submitted in a format compatible with the baseline schedule format. Each proposed revision shall be submitted as a separate schedule, with the following minimum requirements:

1. A critical path method diagram showing revised and affected activities or Milestones.
2. An activity report for all revised and affected activities or Milestones.

**C.** Upon acceptance of the recovery schedule by CITY, data shall be added or revised for all new or revised activities and incorporated into the approved baseline project schedule.

## **6.06 Substitutes and "Or-Equal" Items**

**A.** Materials or equipment: Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance and quality required. Unless the specification or description contains, or is followed by, words reading that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to CITY for review by CITY's Representative under the following circumstances:

1. "Or-Equal": If, prior to receipt of Bids, Bidder proposes an item of material or equipment as functionally equal to that named and sufficiently similar so that no change in related Work will be required, CITY's Representative may request DESIGN PROFESSIONAL to consider it as an "or-equal" item. DESIGN PROFESSIONAL will review and recommend the acceptance, or rejection, of the proposed item to the CITY's Representative. For the purposes of this Paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment DESIGN PROFESSIONAL determines that:

(1) it is at least equal in quality, durability, appearance, strength, and design characteristics; and

(2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; and

b. Bidder certifies that:

(1) there is no increase in cost to the CITY; and

(2) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

If the CITY's Representative approves the proposed item, it may be accepted by CITY.

**2. Substitute Items:** If CONTRACTOR proposes an item of material or equipment as a substitute item, then CONTRACTOR shall submit sufficient information as provided below to allow CITY's Representative to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the CITY's Representative will include the following as supplemented in the General Requirements and as CITY's Representative may determine is appropriate under the circumstances:

a. Requests for review of proposed substitute items of material or equipment will not be accepted by CITY's Representative from anyone other than CONTRACTOR.

b. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall first make written application to CITY's Representative for acceptance thereof.

c. In the application, CONTRACTOR shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will impact CONTRACTOR's achievement of Substantial Completion, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with CITY for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

d. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by CITY's Representative in evaluating the proposed substitute. CITY's Representative may require CONTRACTOR to furnish additional data about the proposed substitute.

If the CITY's Representative approves the proposed item, CITY may accept it.

**B. Substitute Construction Methods or Procedures:** If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to DESIGN PROFESSIONAL. CONTRACTOR shall notify CITY and submit sufficient information to allow DESIGN PROFESSIONAL, in DESIGN PROFESSIONAL's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents.

**C. Expenses:** Bidder shall provide all data in support of any “or equal” at Bidder’s expense, and CONTRACTOR shall provide all data in support of any proposed substitute at CONTRACTOR’s expense.

**D. Evaluation:** DESIGN PROFESSIONAL and CITY’s Representative will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.06 A, and 6.06 B. CITY will be the sole judge of acceptability. No “or-equal” or substitute will be ordered, installed or utilized without CITY’s prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. CITY may require CONTRACTOR to furnish at CONTRACTOR’s expense, a special performance guarantee or other surety with respect to any “or-equal” substitute. DESIGN PROFESSIONAL will record time required by DESIGN PROFESSIONAL and Consultants in evaluating substitutes proposed or submitted by CONTRACTOR pursuant to Paragraphs 6.06 A and 6.06 B and in making changes in the Contract Documents (or in the provisions of any other direct contract with CITY for work on the Project) occasioned thereby. Whether or not CITY accepts a substitute so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse CITY for the reasonable charges of DESIGN PROFESSIONAL and Consultants for evaluating each such proposed substitute.

### **6.07 Concerning Subcontractors, Suppliers and Others**

**A.** CONTRACTOR shall not employ or retain any Subcontractor, Supplier or other person or organization (including those acceptable to CITY as indicated in Paragraph 6.07 B), whether initially or as a substitute, against whom CITY has a reasonable objection, including but not limited to debarment by City or another governmental entity or decertification of the Subcontractor from the City’s Minority and Women’s Business Enterprise Program as a result of the Subcontractor’s failure to comply with any of the requirements of the provisions of Chapter 3 of the City’s Code as determined by the Director of the Human Relations Department. Contractor shall insert this provision in any subcontractor agreement associated with this Contract. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection. CONTRACTOR shall submit required information for all Subcontractors on Form 01290.09 - Subcontractor and Major Material Suppliers List, provided in these Contract Documents, prior to Subcontractor beginning Work at the Site.

**B.** The Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) to be submitted to CITY on or before the date specified in the Supplementary Conditions, for acceptance by CITY. If CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, CITY may accept (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Contract Documents) any such Subcontractor, Supplier or other person or organization so identified, or may reject same on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier or other person or organization. The Contract Price will be adjusted by the difference in the cost occasioned by such substitution, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by CITY of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of CITY or DESIGN PROFESSIONAL to reject defective Work.

**C.** CONTRACTOR shall be fully responsible to CITY for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR’s own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between CITY or DESIGN PROFESSIONAL and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of CITY or DESIGN PROFESSIONAL to pay or to see to the payment of any moneys due

any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws or Regulations.

**D.** CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

**E.** CONTRACTOR shall contractually require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with CITY and DESIGN PROFESSIONAL through CONTRACTOR.

**F.** The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

**G.** All Work performed for CONTRACTOR by a Subcontractor or Supplier shall be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor or Supplier that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of CITY. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against CITY, CONTRACTOR, DESIGN PROFESSIONAL, Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any perils, to the extent covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

**H.** Except as otherwise provided in this subsection H and in accordance with the provisions of subsection C hereof, the agreement between CONTRACTOR and the Subcontractor or Supplier referred to in subsection G, shall provide that the CONTRACTOR and the Subcontractor or Supplier agree not to request CITY or CITY's Representative to intervene in or facilitate the resolution of claims or contract disputes arising out of or related to the agreement between CONTRACTOR and the Subcontractor or Supplier. Furthermore, the Contracts between CONTRACTOR and Subcontractors or Suppliers shall provide that all unresolved claims and disputes between CONTRACTOR and the Subcontractor or Supplier that remain unresolved after thirty (30) calendar days from the notice of claim, shall be subject to mediation as a condition precedent to the institution of legal proceedings by either party. Any such mediation shall be conducted in accordance with the CITY's Code Section 3-467.

**I.** CONTRACTOR shall not insert any provision in any subcontractor agreement associated with this Contract that explicitly states or implies that the subcontractor shall only be paid for work performed if or when the general CONTRACTOR is paid by the CITY . Contractor's compliance with this provision is a material term of this Contract.

**J.** CONTRACTORS shall not deny any Subcontractor subcontracting opportunities solely because the Subcontractor is not a signatory to collective bargaining agreements with organized labor.

## **6.08 Patent Fees and Royalties**

**A.** CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation into the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work, and if to the actual knowledge of CITY or DESIGN PROFESSIONAL its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by CITY in the Contract Documents. To the fullest extent permitted by Laws or Regulations, CONTRACTOR shall defend, indemnify and hold harmless CITY, DESIGN PROFESSIONAL, Consultants and the

officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation into the Work of any invention, design, process, product or device not specified in the Contract Documents.

## **6.09 Permits**

**A.** Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. CITY shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Contract. CONTRACTOR shall pay all charges of utility owners for connections to the Work.

**B.** CONTRACTOR, at its own expense, shall comply with all Federal, State and local laws and regulations, including, but not limited to the Missouri Clean Water Law (Chapter 644 RSMo) together with any accompanying regulation(s) contained in the Missouri Code of State Regulations (CSR Title 10), as well as any implementing permits, together with any CITY Provisions during the life of this Contract including but not limited to:

1. Approvals and permits as required for construction or land disturbance activities.

2. Compliance with the State of Missouri – Department of Natural Resources (“MDNR”) Missouri State Operating Permit (“Land Disturbance Permit”), MO-R100006 for all construction or land disturbance activity.

3. Development and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

(a) Contractor shall not commence land disturbance activity until the initial SWPPP has been finalized.

(b) Preparation and submittal of all applications, documentation and exhibits required to obtain MDNR approvals for uninterrupted Work at the Site.

(c) Amending/Updating SWPPP.

(d) Site Inspections and submittal of Inspection Reports

(e) Proper Operation and Maintenance to achieve compliance with the terms of the Permit.

(f) Maintenance of required records in accordance with MDNR requirements and requirements included in Article 6 of these Contract Documents.

4. In addition to requirements of Article 6, Contractor shall also provide record access to Missouri Department of Natural Resources (MDNR).

5. Failure to control erosion and water pollution is a permit violation. CONTRACTOR shall have 24 hours after receiving notice of the violation to correct the problem. If the CONTRACTOR fails to correct the problem after the time prescribed, the City will hire a remediation expert to fix the problem. In such an event, the CONTRACTOR shall be liable to the City for the remediation costs plus a 10% mark-up of the total contract price. If the CONTRACTOR receives three (3) notices of violation of the erosion control plan and the City’s MS4 permit, the Director may issue a stop work order and delay any payment until control measures are properly functioning and stream damage has been mitigated. In such an event, any delay to the project schedule will result in liquidated damages assessed against the CONTRACTOR.



## 6.10 Compliance with Laws and Regulations

**A. CONTRACTOR** shall give all notices and comply with all Laws or Regulations applicable to furnishing and performing the Work. Except where otherwise expressly required by applicable Laws or Regulations, neither CITY nor DESIGN PROFESSIONAL shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations. The Laws or Regulations included in this Paragraph shall include, but not be limited to, those set forth in the Supplementary Conditions.

**B. Failure to Comply.** If CONTRACTOR performs any Work in violation of applicable Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting therefrom; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws or Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under Paragraph 3.03.

**C. Conflicts of Interest.** The provisions of City's Code Sections 2-1015 and 3-301, prohibiting City officers and employees from having a financial or personal interest in any contract with City, and Code Sections 3-307, and 3-309, imposing sanctions for violations, shall apply to this Contract. CONTRACTOR certifies that no officer or employee of City has, or will have, a direct or indirect financial or personal interest in this Contract, and that no officer or employee of City, or member of such officer's or employee's immediate family, either has negotiated, or has or will have an arrangement concerning employment to perform services on behalf of CONTRACTOR on this Contract.

**D. Licenses and Permits.** CONTRACTOR, at its own expense, shall secure or cause to be secured all licenses and permits from public or private sources necessary for the fulfillment of its obligations under this Contract. All references in this Contract to the "Code" shall mean City's Code of Ordinances, including any amendments thereto or re-codification thereof unless the context clearly indicates otherwise. CONTRACTOR shall obtain copies of all necessary licenses and permits from Subcontractors required for the Work before Subcontractors begin Work at the Site. CONTRACTOR shall retain such evidence in its files and make available to CITY within ten (10) days after CITY's written request.

**E. Americans with Disabilities Act.** CONTRACTOR agrees to comply, during the course of this Contract, with all provisions of Title II of the 2010 ADA Standards for Accessible Design as amended from time to time.

**F. Affirmative Action.** If the Contract Price exceeds \$300,000.00 and CONTRACTOR employs fifty (50) or more people, CONTRACTOR shall comply with City's Affirmative Action requirements in accordance with the provisions of Chapter 3 of City's Code, the rules and regulations relating to those sections, and any additions or amendments thereto. CONTRACTOR shall not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 3 of City's Code.

CONTRACTOR shall:

1. Submit, in print or electronic format, a copy of CONTRACTOR'S current certificate of compliance to the City's Human Relations Department (HRD) prior to receiving the first payment under the contract, unless a copy has already been submitted to HRD at any point within the previous two calendar years. If, and only if, CONTRACTOR does not possess a current certification of compliance, CONTRACTOR shall submit, in print or electronic format, a copy of its affirmative action program to HRD prior to receiving the first payment under the contract, unless a copy has already been submitted to HRD at any point within the previous two calendar years.

2. Require any Subcontractor awarded a subcontract exceeding \$300,000.00 to affirm that Subcontractor has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the subcontract.

3. Obtain from any Subcontractor awarded a subcontract exceeding \$300,000.00 a copy of the Subcontractor's current certificate of compliance and tender a copy of the same, in print or electronic format, to HRD within thirty (30) days from the date the subcontract is executed. If, and only if, Subcontractor does not possess a current certificate of compliance, CONTRACTOR shall obtain a copy of the Subcontractor's affirmative action program and tender a copy of the same, in print or electronic format, to HRD within thirty (30) days from the date the subcontract is executed.

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

**G. Minority and Women Business Enterprises and Workforce.** City is committed to ensuring that minorities and women participate to the maximum extent possible in the performance of City's construction contracts. If minority and women business enterprise (M/WBE) goals have been set for this Contract, CONTRACTOR agrees to comply with all requirements of City's Minority and Women's Business Enterprise Program as enacted in City's Code, Sections 3-421 through 3-469 and as hereinafter amended. CONTRACTOR shall meet or exceed both the MBE and WBE goals set forth in its Contractor Utilization Plan/Request for Waiver. If workforce utilization goals are applicable to this Contract, CONTRACTOR agrees to comply with all requirements of City's Construction Employment Program as enacted in City's Code, Sections 3-501 through 3-525 and as hereinafter amended. CONTRACTOR shall meet or exceed the construction employment goals unless the same shall have been waived in the manner provided by law. CONTRACTOR's compliance with this provision is a material part of this Contract.

**H. Records.**

1. For purposes of this section:

(a) "City" shall mean the City Auditor, the City's Internal Auditor, the City's Director of Human Relations, the City Manager, the City department administering this Contract and their delegates and agents.

(b) "Record" shall mean any document, book, paper, photograph, map, sound recordings or other material, regardless of physical form or characteristics, made or received in connection with this Contract and all Contract amendments and renewals.

2. Contractor shall maintain and retain all Records for a term of five (5) years that shall begin after the expiration or termination of this Contract and all Contract amendments. City shall have a right to examine or audit all Records and Contractor shall provide access to City of all records upon ten (10) days written notice from the City.

**I. Prevailing Wage.**

1. CONTRACTOR shall comply and require its Subcontractors to comply with;

a. sections 290.210 to 290.340, RSMO the State of Missouri Prevailing Wage Law (the "Law"); and

b. 8 CSR 30-3.010 to 8 CSR 30-3.060, the Prevailing Wage Law Rules (the "Rules"); and

c. the Annual Wage Order (Wage Order) issued by the State of Missouri's Department of Labor and Industrial Relations; and

d. any applicable Annual Incremental Wage Increase (Wage Increase) to the Annual Wage Order.

2. The Law, Rules, Annual Wage Order and any Wage Increase are incorporated into and made part hereof this Contract and shall be collectively referred to in this Section as the "Prevailing Wage Requirements."

3. CONTRACTOR shall pay and require its Subcontractors to pay to all workers performing work under this Contract not less than the prevailing hourly rate of wages for the class or type of work performed by the worker in accordance with the Law, Rules, Wage Order and any applicable Wage Increase. CONTRACTOR shall take whatever steps are necessary to insure that the prevailing hourly wage rates are paid and that all workers for CONTRACTOR and each of its Subcontractors are paid for the class or type of work performed by the worker in accordance with the Prevailing Wage Requirements. If CONTRACTOR shall fail to start to perform CONTRACTOR's obligations under the Contract Documents within sixty (60) days from the Effective Date of the Contract, CONTRACTOR and each of its subcontractors shall be obligated to pay all workers in accordance with any new Wage Order, as subsequently amended by any applicable Wage Increase, issued by the Department of Labor and Industrial Relations within the aforementioned sixty (60) day period. The new Wage Order and any applicable Wage Increase shall govern notwithstanding the fact that the Wage Order being replaced might be physically attached or incorporated in the Contract Documents.

4. Prior to each of its Subcontractors beginning Work on the Site, CONTRACTOR shall require each Subcontractor to complete CITY's Form 00490 entitled "Pre-contract Certification" that sets forth the Subcontractor's prevailing wage and tax compliance history for the two (2) years prior to the bid. CONTRACTOR shall retain one (1) year and make the Pre-contract Certifications available to CITY within five (5) days after written request.

5. CONTRACTOR shall:

a. Keep and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to keep full and accurate records on City's "Daily Labor Force Report" Form indicating the worker's name, occupational title or classification group & skill and the workers' hours. City shall furnish blank copies of the Daily Labor Force Report Form to Contractor for its use and for distribution to Subcontractors. Contractor shall submit its and its Subcontractors Daily Labor Force Reports to City each day; and

b. Submit, and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to submit electronically, in a format prescribed by the City, Certified Payroll Report Information indicating the worker's name, address, social security number, occupation(s), craft(s) of every worker employed in connection with the public work together with the number of hours worked by each worker and the actual wages paid in connection with the Project and other pertinent information as requested by the City; and

c. Submit, and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to submit, electronically, in format prescribed by the City, a Payroll Certification. The Payroll Certification must be signed by the employee or agent who pays or supervises the payment of the workers employed under the Contract for the Contractor and each Subcontractor; and

d. The Daily Labor Force Report, documents used to compile information for the Certified Payroll Report, and Payroll Certification are collectively referred to in this Section as the "Records."

6. CONTRACTOR shall submit its and its Subcontractors Daily Labor Force Reports to CITY each day. CONTRACTOR shall make all of CONTRACTOR's and Subcontractors' Records open to inspection by any authorized representatives of OWNER and the Missouri Department of Labor and Industrial Relations at any reasonable time and as often as they may be necessary and such Records shall not be destroyed or removed from the State of Missouri for a period of one (1) year following the completion of the public work in connection with which the Records are made. CONTRACTOR shall have its and its Subcontractors Certified Payroll Reports and Payroll Certifications available at the CONTRACTOR's office and shall provide the Records to the City electronically at City's sole discretion. In addition, all Records shall be considered a public record and CONTRACTOR shall provide the Records

to the CITY in the format required by the CITY within three (3) working days of any request by CITY at the CONTRACTOR's cost. CITY, in its sole discretion, may require CONTRACTOR to send any of the Records directly to the person who requested the Record at CONTRACTOR's expense.

7. CONTRACTOR shall post and keep posted a clearly legible statement of all prevailing hourly wage rates to be paid to all workers employed by CONTRACTOR and each of its Subcontractors in the performance of this Contract in a prominent and easily accessible place at the Site of the Work by all workers.

8. If the Contract Price exceeds \$250,000.00, CONTRACTOR shall and shall require each Subcontractor engaged in any construction of public works to have its name, acceptable abbreviation or recognizable logo and the name of the city and state of the mailing address of the principal office of the company, on each motor vehicle and motorized self-propelled piece of equipment which is used in connection with the Project during the time the CONTRACTOR or Subcontractor is engaged on the project. The sign shall be legible from a distance of twenty (20') feet, but the size of the lettering need not be larger than two (2") inches. In cases where equipment is leased or where affixing a legible sign to the equipment is impractical, the CONTRACTOR may place a temporary stationary sign, with the information required pursuant to this section, at the main entrance of the Project in place of affixing the required information on the equipment so long as such sign is not in violation of any state or federal statute, rule or regulation. Motor vehicles which are required to have similar information affixed thereto pursuant to requirements of a regulatory agency of the state or federal government are exempt from the provisions of this subsection.

9. CONTRACTOR must correct any errors in CONTRACTOR's or any Subcontractors' Records, or CONTRACTOR's or any Subcontractors' violations of the Law, Rules, Annual Wage Order and any Wage Increase within fourteen (14) calendar days after notice from CITY.

10. CONTRACTOR shall and shall require its Subcontractors to cooperate with the CITY and the Department of Labor and Industrial Relations in the enforcement of this Section, the Law, Rules, Annual Wage Order and any Wage Increase. Contractor shall and shall require its Subcontractors to permit CITY and the Department of Labor and Industrial Relations to interview any and all workers during working hours on the Project at CONTRACTOR's sole cost and expense.

11. CONTRACTOR shall file with CITY, upon completion of the Project and prior to final payment therefore, affidavits from CONTRACTOR and each of its Subcontractors, stating that each has fully complied with the provisions and requirements of the Missouri Prevailing Wage Law. CITY shall not make final payment until the affidavits, in proper form and order, from CONTRACTOR and each of its Subcontractors, are filed by CONTRACTOR.

12. CONTRACTOR shall forfeit as a statutory penalty to the CITY one hundred dollars (\$100.00) for each worker employed, for each calendar day, or portion thereof, such worker is paid less than the prevailing hourly rates for any work done under this Contract, by CONTRACTOR or by any of CONTRACTOR's Subcontractors. If CONTRACTOR or any of its Subcontractors have violated any section(s) of 290.210 to 290.340, RSMo, in the course of the execution of the Contract, CITY shall when making payments to the CONTRACTOR becoming due under this Contract, withhold and retain therefrom all sums and amounts due and owing as a result of any violation of sections 290.210 to 290.340, RSMo.

**J. Prevailing Wage Damages.** CONTRACTOR acknowledges and agrees that, based on the experience of CITY, violations of the Missouri Prevailing Wage Act, whether by CONTRACTOR or its Subcontractors, commonly result in additional costs to CITY. CONTRACTOR agrees that additional costs to CITY for any particular violation are difficult to establish and include but are not limited to: costs of construction delays, additional work for CITY, additional interest expenses, investigations, and the cost of establishing and maintaining a special division working under the City Manager to monitor prevailing wage compliance.

1. In the event of the failure by CONTRACTOR or any of its Subcontractors to pay wages as provided in the Missouri Prevailing Wage Act, CITY shall be entitled to deduct from the Contract Price, and shall retain as liquidated damages, one hundred dollars (\$100.00) per day, per worker who is paid less than the prevailing hourly rate of wages, to approximate the additional costs. The sum shall be deducted, paid or owed whether or not the Contract Times have expired.

2. CITY shall give written notice to CONTRACTOR setting forth the workers, who have been underpaid, the amount of the statutory penalty and the amount of the liquidated damages as provided for in this Subparagraph J. CONTRACTOR shall have fourteen (14) calendar days to respond, which time may be extended by CITY upon written request. If CONTRACTOR fails to respond within the specified time, the CITY's original notice shall be deemed final. If CONTRACTOR responds to CITY's notice, CITY will furnish CONTRACTOR a final decision in writing within five (5) days of completing any investigation.

**K. Missouri Secretary of State Business Entity Registration.** CONTRACTOR shall obtain from all Subcontractors for the Project, a copy of their current certificate of good standing or fictitious name registration from the Missouri Secretary of State before they begin work on the Site. CONTRACTOR shall retain such documents in its files and make available to CITY within ten (10) days after written request.

**L. Tropical Hardwoods.** The provisions of Code Section 2-1872, restricting the use of tropical hardwoods, shall apply to this Contract.

**M. Preference for Missouri Products.** Pursuant to Section 71.140 RSMo., preference shall be given to materials, products, supplies and all other articles produced, manufactured, made or grown within the State of Missouri.

**N. Guidelines for Open Excavations.**

1. CONTRACTOR shall restore required excavations to the level of the adjacent surfaces as soon as practicable. Unsupervised open excavations on public properties are discouraged at all times. If CONTRACTOR, in performance of the Work, makes or causes to be made any excavation in, upon, under, through or adjoining any street, sidewalk, alley, park, boulevard, parkway or any other public properties, and shall leave any part or portion thereof open, CONTRACTOR shall provide effective protection to the public.

2. CONTRACTOR shall protect and secure all excavations in roadways in compliance with existing federal, state and local codes and standards, including, but not limited to the most current edition of the Manual of Uniform Traffic Control Devices. CONTRACTOR shall protect and secure all unsupervised excavations not within roadways, either by covering or fencing.

a. Covering. A protective cover that can sustain the weight of persons or of objects that are placed upon it may be installed over an unsupervised excavation. The cover shall be secured to the ground to prevent movement. Protective covers shall have no opening(s) or protuberance(s) of sufficient size to cause a fall and/or injury. Advance warning devices shall be installed as necessary.

b. Fencing. Fencing to prevent entry may be installed surrounding an unsupervised excavation not protectively covered in its entirety. The fencing shall be a minimum of 42" in height. The fencing shall be constructed in such a manner that it is adequately secured and will remain upright at all times under normal Site conditions. All protective coverings and fences over and around excavations shall be inspected at least daily to assure integrity. Protective coverings and/or fences in heavily trafficked areas shall be inspected more often as necessary.

**O. Notification of Utilities.** CONTRACTOR shall adhere to the provisions of Sections 319.010 et seq., RSMo., which requires that a person or firm making an excavation in any public street, road or alley, right of way dedicated to public use, utility easement of record, or within any private street or private property do so only after giving notice to, and obtaining information from,

owners of Underground Facilities. The 24-hour, toll-free accident prevention hotline number in Missouri is 1-800-344-7483 (1-800-Digrite).

**P. Employee Eligibility Verification.** CONTRACTOR shall adhere to the provisions of Sections 285.525 et seq., RSMo., which requires that for any contract exceeding five thousand dollars (\$5,000.00), CONTRACTOR shall execute and submit an affidavit, in a form prescribed by CITY, affirming that CONTRACTOR does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. § 1324a(h)(3). CONTRACTOR shall attach to the affidavit documentation sufficient to establish CONTRACTOR'S enrollment and participation in an electronic verification of work program operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and Control Act of 1986. CONTRACTOR may obtain additional information about E-Verify and enroll at <https://e-verify.uscis.gov/enroll/StartPage.aspx?JS=YES>. For those Contractors enrolled in E-Verify, the first and last pages of the E-Verify Memorandum of Understanding that CONTRACTOR will obtain upon successfully enrolling in the program shall constitute sufficient documentation for purposes of complying with this Section. CONTRACTOR shall submit the affidavit and attachments to CITY prior to execution of the Contract, or at any point during the term of the Contract if requested by City.

**Q. OSHA 10-Hour Training Requirement.** CONTRACTOR and any subcontractor working under this Contract shall require every employee on the Site to complete a ten-hour construction safety program which meets the requirements of Section 292.675, RSMo, except for those employees who shall have previously completed the required program and hold documentation to that effect. CONTRACTOR shall remove or require the removal of any person from the Site who is subject to this requirement and who does not complete or is unable to produce documentation of their successful completion of the required program within the time limitations prescribed by Section 292.675, RSMo. CONTRACTOR shall forfeit the sum of two thousand five hundred dollars (\$2,500.00), in addition to one hundred dollars (\$100.00) per employee each calendar day, or portion thereof, the employee(s) shall continue to be employed without having completed the required program within the time limitations prescribed by Section 292.675, RSMo. CITY shall be entitled to withhold and retain any amounts due and owing hereunder when making payment to CONTRACTOR.

**R. Clean Air Act and Clean Water Act.** CONTRACTOR shall comply with requirements of the Clean Air Act (42 U.S.C. 7401 et seq.); Clean Water Act (33 U.S.C. 1251 et seq.), Missouri Clean Water Law (Chapter 644 RSMo), Code of Federal regulations (Title 40: Protection of Environment, Title 33: Navigation and Navigable Waters) and the rules of the Missouri Code of State Regulations (CSR Title 10).

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

**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 paid a fee of ten percent (10%) of the costs incurred by such Subcontractor under Paragraphs 11.02 A.1 and 11.02 A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent (5%) of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.02 A.4, 11.02 A.5 and 11.02 B;

e. the amount of credit to be allowed by CONTRACTOR to CITY for any change which results in a net decrease in cost will be the amount of the actual net decrease in costs plus a deduction in CONTRACTOR's fee by an amount equal to five percent (5%) of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.01 D.2.a through 11.01 D.2.e, inclusive.

**E.** Whenever the Cost of the Work is to be determined pursuant to Paragraphs 11.02 A and B, CONTRACTOR shall establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to CITY an itemized cost breakdown together with supporting data.

## **11.02 Cost of the Work**

**A.** The term "Cost of the Work" means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a request for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the request. Except as otherwise agreed to in writing by CITY, costs covered by Change Orders or requests shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any costs itemized in 11.02 B:

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work, using occupational titles and job classifications agreed upon by CITY and CONTRACTOR. Such employees shall include, without limitation, job Site superintendents, foremen and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing the Work after regular working hours, on Saturdays, Sundays or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated into the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless CITY deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to CITY. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to CITY, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed or furnished by Subcontractors. If required by CITY, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to CITY who will then determine, with the advice of DESIGN PROFESSIONAL, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of the Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in Paragraphs 11.01 D and E and 11.02 A and B. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work when such services are approved in advance by CITY in writing.

5. Other costs including the following:

a. The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the Site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by CITY with the advice of DESIGN PROFESSIONAL, and the costs of transportation, loading, unloading, installation, assembly, dismantling and removal thereof, all in accordance with the terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

d. Applicable sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws or Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses required to perform the Work.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by CITY in accordance with Article 5), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of CITY. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for those services a fee proportionate to that stated in Paragraph 11.01 D.2.

g. The cost of utilities, fuel and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage and similar petty cash items in connection with the Work.

i. Cost of premiums for additional or increased Bonds, or for insurance required because of approved changes in the Work.

**B. Costs excluded:** The term "Cost of the Work" shall not include any of the following:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the Site or in CONTRACTOR's principal or a branch office for general administration of the Work (if not specifically included in the agreed upon occupational titles and job classifications referred to in Paragraph 11.02 A.1 or specifically covered by Paragraph 11.02 A.4), all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials, or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 11.02 A.

### **11.03 Cash Allowances**

**A.** It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to CITY. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

**B.** Prior to final payment, an appropriate Change Order will be issued by CITY to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

#### **11.04 Unit Price Work**

**A.** Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made in accordance with Paragraph 9.06.

**B.** Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

**C.** CITY or CONTRACTOR may negotiate an adjustment of the price per unit of Unit Price Work stated in the Contract if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs by twenty percent (20%) or more from the estimated quantity of such item indicated in the Contract; and
2. there is no corresponding adjustment with respect to any other item of Work; and
3. CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or CITY believes that CITY is entitled to a decrease in Contract Price.

#### **11.05 Dispute Resolution**

**A.** If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price in accordance with Article 11 within fourteen (14) calendar days from the receipt of supporting documentation of the request pursuant to 11.01.B., unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted, then a Claim for such adjustment may be made pursuant to Article 16.

### **ARTICLE 12 CONTRACT TIMES**

#### **12.01 Time of the Essence**

**A.** All times stated in the Contract Documents are of the essence of the Contract.

#### **12.02 Change of Contract Times**

**A.** The Contract Times (or Milestones) may only be changed by a Change Order. Any request for an adjustment in the Contract Times shall be based on written notice delivered within fourteen (14) calendar days after occurrence of the event giving rise to the request or within fourteen (14) calendar days after first recognition of the conditions giving rise to the request. Thereafter, the CONTRACTOR shall submit written documentation of its requests, including appropriate supporting documentation, within ten (10) days after giving notice, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted.

#### **12.03 Proof Required To Justify an Extension of Time For Excusable and Compensable Delays**

**A.** In support of any request for an extension of the Contract Times pursuant to this Article, CONTRACTOR must demonstrate to the reasonable satisfaction of the CITY that the critical path of the approved baseline project schedule was delayed. CONTRACTOR shall be entitled to an increase in contract time for the number of days that the critical path was delayed solely as a

result of the compensable or excusable event. A compensable or excusable event includes, but is not limited to:

1. unreasonable delay of issuance of Notice to Proceed by CITY;
2. CITY's unreasonable delay of delivery furnished materials, equipment, or work;
3. unreasonable delay responding to shop drawings and submittals;
4. CITY's unreasonable delay in issuing a Change Order;
5. an order by the CITY to stop the Work where the CONTRACTOR was not at fault; and
6. other reasonable grounds as determined by the City in its sole discretion.

**B.** CONTRACTOR shall compare the critical path of the approved baseline project schedule to the actual critical path of the Work, identifying the specific impact of the compensable or excusable event.

**C.** CONTRACTOR shall submit to the CITY a written time impact analysis illustrating the influence of each compensable or excusable event on the date of Substantial Completion. The time impact analysis shall demonstrate the time impact based on the date of the delay in time and the event time computations or all affected activities.

**D.** If the critical path of the Work is delayed by "Force Majeure", the CONTRACTOR shall be entitled only to an extension of the Contract Times for the number of days of delay to the critical path. For purposes of this paragraph, "Force Majeure" shall mean fire, tornado, flood, earthquake, war, act of terrorism, civil disturbance, or labor strikes away from the project site.

**E.** Extensions of contract time pursuant to the this section will be granted only to the extent that the time adjustments exceed the total float time available when the event causing the delay occurred.

#### **12.04 Delays Within CONTRACTOR's Control**

**A.** The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

#### **12.05 Delays Beyond the CITY's and CONTRACTOR's Control**

**A.** Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both CITY and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

#### **12.06 Delay Damages**

**A.** In no event shall CITY be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR, or
2. delays beyond the control of CITY or CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

**B.** Nothing in this Paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inaction of CITY, DESIGN PROFESSIONAL, Consultant or anyone for whom CITY, DESIGN PROFESSIONAL or Consultant is responsible.

## **12.07 Dispute Resolution**

**A.** If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Time in accordance with Article 12 within fourteen (14) calendar days from the receipt of supporting documentation of the request pursuant to 12.02, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted, then a Claim for such adjustment may be made pursuant to Article 16.

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

### **13.01 Access to Work**

**A.** CITY, DESIGN PROFESSIONAL, Consultants, other representatives and personnel of CITY, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Site and Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

### **13.02 Tests and Inspections**

**A.** CONTRACTOR shall give DESIGN PROFESSIONAL and CITY's Representative timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

**B.** If any Work (or the work of others at the Site) that is to be inspected, tested or approved is covered by CONTRACTOR without written approval required by Paragraphs 13.02 D or 13.02 E, it must, if requested by CITY's Representative, be uncovered for observation.

**C.** Uncovering Work as provided in Paragraph 13.02 B, shall be at CONTRACTOR's expense unless CONTRACTOR has given DESIGN PROFESSIONAL and CITY's Representative timely notice of CONTRACTOR's intention to cover the same and DESIGN PROFESSIONAL and CITY's Representative have not acted with reasonable promptness in response to such notice.

**D.** If Laws or Regulations of any public body (including City) having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish DESIGN PROFESSIONAL and CITY's Representative the required certificates of inspection or approval.

**E.** CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for CITY's and DESIGN PROFESSIONAL's acceptance of materials or equipment to be incorporated into the Work, or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation into the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to CITY and DESIGN PROFESSIONAL.

**F.** CITY shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests or approvals covered by Paragraph 13.02 D and E;
2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04 B shall be paid as provided in said Paragraph 13.04 B; and
3. as otherwise specifically provided in the Contract Documents.

### **13.03 Notice of Defects**

A. Prompt notice of all defective Work of which either CITY or DESIGN PROFESSIONAL has actual knowledge will be given to CONTRACTOR. Defective Work may be rejected, corrected or accepted as provided in this Article 13.

### **13.04 Uncovering Work**

A. If any Work (or the work of others at the Site) is covered contrary to the written request of DESIGN PROFESSIONAL or CITY's Representative, it must, if requested by CITY's Representative, be uncovered for DESIGN PROFESSIONAL's or CITY's Representative's observation and replaced at CONTRACTOR's expense.

B. If CITY considers it necessary or advisable that covered Work be observed by DESIGN PROFESSIONAL or CITY's Representative or be inspected or tested by others, CONTRACTOR, at CITY's request, shall uncover, expose or otherwise make available for observation, inspection or testing as may be required, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefore as provided in Article 16.

### **13.05 CITY May Stop the Work**

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, CITY may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of CITY to stop the Work shall not give rise to any duty on the part of CITY to exercise this right for the benefit of CONTRACTOR, any Subcontractor, Supplier, other individual or entity or any surety or employee or agent of any of them.

### **13.06 Correction or Removal of Defective Work**

A. If required by CITY, CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by either DESIGN PROFESSIONAL or CITY's Representative, remove it and replace it with Work that is not defective. CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

### **13.07 Correction Period**

A. If within one (1) year after the date of Substantial Completion, or such longer period of time as may be prescribed by Laws or Regulations, by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by CITY or permitted by Laws and Regulations as contemplated in Paragraph 6.10 is found to be defective, CONTRACTOR shall promptly, without cost to CITY and in accordance with CITY's written instructions:

1. correct the repair of damages to such land or areas; or
2. correct such defective Work, or if it has been rejected by CITY, remove it from the Site and replace it with Work that is not defective; and
3. satisfactorily correct or remove and replace any damage to other Work or to the work of others or damage to other lands or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in the event of an emergency where delay by CONTRACTOR would cause serious risk of loss or damage, CITY may have the defective Work corrected or the rejected Work removed and replaced, and all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

**B.** In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

**C.** Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one (1) year, or such longer period of time as may be prescribed within Paragraph 13.07 A, after such correction or removal and replacement has been satisfactorily completed.

**D.** CONTRACTOR's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or waiver of the provisions of any applicable statute of limitation or repose.

### **13.08 Acceptance of Defective Work**

**A.** If, instead of requiring correction or removal and replacement of defective Work, CITY prefers to accept it, CITY may do so. CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to CITY's evaluation of and determination to accept such defective Work and shall pay OWNER for the diminished value of the Work. If any such acceptance occurs prior to DESIGN PROFESSIONAL's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work and, due to the diminished value of the Work, CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. If the acceptance of defective Work occurs after such recommendation, an appropriate amount shall be paid by CONTRACTOR to CITY.

### **13.09 CITY May Correct Defective Work**

**A.** If CONTRACTOR fails within a reasonable time after written notice from DESIGN PROFESSIONAL or CITY's Representative to correct defective Work or to remove and replace rejected Work as required by CITY in accordance with Paragraph 13.06, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, CITY may, after seven (7) days written notice to CONTRACTOR, correct and remedy any such deficiency.

**B.** CITY shall proceed expeditiously when exercising the rights and remedies under this Paragraph 13.09. In connection with such corrective and remedial action, CITY may exclude CONTRACTOR from all or part of the Site; take possession of all or part of the Work and suspend CONTRACTOR's services related thereto; take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site; and incorporate into the Work all materials and equipment stored at the Site or for which CITY has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow CITY, CITY's Representative, agents and



employees, CITY's other contractors, DESIGN PROFESSIONAL and Consultants access to the Site to enable CITY to exercise the rights and remedies under this Paragraph 13.09.

**C.** All costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by CITY in exercising such rights and remedies will be charged against CONTRACTOR and a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work; and CITY shall be entitled to an appropriate decrease in the Contract Price. If CITY and CONTRACTOR are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. Such Claims for costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal and replacement of CONTRACTOR's defective or rejected Work.

**D.** CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by CITY of CITY's rights and remedies under Paragraphs 13.06 and 13.09.

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

### **14.01 Schedule of Values**

**A.** 01290.02 Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into form 01290.01 Application for Payment acceptable to DESIGN PROFESSIONAL and CITY. Progress payments for Unit Price Work will be based on the number of units completed.

### **14.02 Application for Progress Payments**

#### **A. Application for Payment**

1. At least twenty (20) days before the date stipulated in the Supplementary Conditions for each progress payment (but not more often than once a month), CONTRACTOR shall submit to DESIGN PROFESSIONAL for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated into the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, paid invoice or other documentation warranting that CITY has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect CITY's interest therein, all of which will be subject to CITY's approval.

2. Beginning with the second Application for Payment, each Application shall include:

a. an affidavit of CONTRACTOR stating that all previous progress payments received for the Work have been applied to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment, and

b. a copy of the most recent 00485.01 M/WBE Monthly Utilization Report CONTRACTOR has submitted to the CITY's Human Relations Department.

c. a copy of the most recent 00485.02 Project Workforce Monthly Report and 00485.03 Company-Wide Workforce Monthly Report CONTRACTOR has submitted to the OWNER's Human Relations Department.

d. an update to the approved schedule pursuant to paragraphs 6.04 and 6.05.

3. The amount of retainage with respect to progress payments will be stated in the Supplementary Conditions.

## **B. Review of Applications**

1. DESIGN PROFESSIONAL will, within ten (10) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to CITY, or return the Application to CONTRACTOR indicating in writing DESIGN PROFESSIONAL's reasons for refusing to recommend payment. In the latter case, CONTRACTOR shall make the necessary corrections and resubmit the Application.

a. After presentation of the Application for Payment to CITY, and if CITY's Representative agrees with DESIGN PROFESSIONAL's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02 B.4) become due and will be paid by CITY to CONTRACTOR, subject to the provisions of Laws or Regulations.

b. No payment shall be approved until the CONTRACTOR has submitted with the Application accompanying documentation as required by the Contract Documents, including, but not limited to, the documentation required by paragraphs 6.04 and 6.05.

2. DESIGN PROFESSIONAL's recommendation of any payment requested in an Application for Payment will constitute a representation by DESIGN PROFESSIONAL to CITY, based on DESIGN PROFESSIONAL's observations of the executed Work as an experienced and qualified DESIGN PROFESSIONAL and on DESIGN PROFESSIONAL's review of the Application for Payment and the accompanying data and schedules, that to the best of DESIGN PROFESSIONAL's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.06, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR being entitled to such payment appear to have been fulfilled in so far as it is DESIGN PROFESSIONAL's responsibility to observe the Work.

3. DESIGN PROFESSIONAL's recommendation of any payment, including final payment, shall not mean that DESIGN PROFESSIONAL is responsible for CONTRACTOR's means, methods, techniques, sequence or procedures of construction, safety precautions and programs incident thereto, or any failure of CONTRACTOR to comply with Laws or Regulations applicable to the furnishing or performance of Work.

4. DESIGN PROFESSIONAL may refuse to recommend the whole or any part of any payment if, in DESIGN PROFESSIONAL's opinion, it would be incorrect to make the representations to CITY referred to in Paragraph 14.02 B.2. DESIGN PROFESSIONAL may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in DESIGN PROFESSIONAL's opinion to protect CITY from loss because:

a. the Work is defective, or completed Work has been damaged requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. CITY has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. DESIGN PROFESSIONAL has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.

### **C. Reduction in Payment**

1. CITY may refuse to make payment of the full amount recommended by DESIGN PROFESSIONAL because:

a. Claims have been made by third parties against CITY on account of CONTRACTOR's performance or furnishing of the Work; or

b. Claims have been made by CITY against CONTRACTOR in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to CITY to secure the satisfaction and discharge of such Claims;

c. there are other items entitling CITY to a set-off against the amount recommended; or

d. CITY has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02 B.4.a through c or 15.02 A.1 through 4; but CITY must give CONTRACTOR written notice (with a copy to DESIGN PROFESSIONAL) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by CITY and CONTRACTOR, when CONTRACTOR corrects to CITY's satisfaction the reasons for such action; or

e. CITY has made a different determination of the actual quantities and classifications of Unit Price Work.

#### **14.03 CONTRACTOR's Warranty of Title**

A. CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated into the Project or not, will pass to CITY no later than the time of payment, free and clear of all Liens.

#### **14.04 Substantial Completion**

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify CITY and DESIGN PROFESSIONAL in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that CITY issue a certificate of Substantial Completion. Within a reasonable time thereafter, CITY, together with CONTRACTOR and DESIGN PROFESSIONAL, shall make an inspection of the Work to determine the status of completion. If DESIGN PROFESSIONAL does not consider the Work substantially complete, DESIGN PROFESSIONAL will notify CONTRACTOR and CITY in writing giving the reasons therefore. If DESIGN PROFESSIONAL considers the Work substantially complete, DESIGN PROFESSIONAL will prepare and deliver to CITY a recommended certificate of Substantial Completion that shall establish the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. CITY shall have seven (7) days after receipt of the recommended certificate during which to make written objection to DESIGN PROFESSIONAL as to any provisions of the certificate or attached list. At the time of delivery of the recommended certificate of Substantial Completion, DESIGN PROFESSIONAL will deliver to CITY and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between CITY and CONTRACTOR with respect to security, operation, safety, protection of the Work, maintenance, heat, utilities, insurance and warranties and guarantees.

B. CITY shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but CITY shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

#### **14.05 Partial Utilization**

A. Use by CITY at CITY's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which CITY, DESIGN PROFESSIONAL and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by CITY for its intended purpose without significant interference with

CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

1. CITY at any time may request CONTRACTOR in writing to permit CITY to use any such part of the Work which CITY believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to CITY and DESIGN PROFESSIONAL that such part of the Work is substantially complete and request CITY to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify CITY and DESIGN PROFESSIONAL in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request CITY to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, CITY, together with CONTRACTOR and DESIGN PROFESSIONAL, shall make an inspection of that part of the Work to determine its status of completion. If DESIGN PROFESSIONAL does not consider that part of the Work to be substantially complete, DESIGN PROFESSIONAL will notify CITY and CONTRACTOR in writing, giving the reasons therefore. If DESIGN PROFESSIONAL considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of Paragraph 5.09 with respect to property insurance.

#### **14.06 Final Inspection**

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, DESIGN PROFESSIONAL will make a final inspection with CITY and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### **14.07 Final Payment**

##### **A. Application for Payment**

1. After CONTRACTOR has completed all corrections required by Paragraph 14.06 to the satisfaction of DESIGN PROFESSIONAL and CITY's Representative and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by Paragraph 5.04, certificates of inspection, marked-up record documents (as provided in Paragraph 6.13) and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation required by the Contract Documents, including but not limited to the evidence of insurance required by Subparagraph 5.04 B.7; and

b. 01290.14 "Contractor Affidavit for Final Payment" from CONTRACTOR and 01290.15 "Subcontractor Affidavit for Final Payment" from all Subcontractors, regardless of tier.

##### **B. Review of Application and Acceptance**

1. If, on the basis of DESIGN PROFESSIONAL's and CITY's Representative's observation of the Work during construction and final inspection, and DESIGN PROFESSIONAL's and CITY's Representative's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, DESIGN PROFESSIONAL and CITY's Representative are satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled,

DESIGN PROFESSIONAL will, within ten (10) days after receipt of the final Application for Payment, indicate in writing DESIGN PROFESSIONAL's and CITY's Representative's recommendation of payment and present the Application to CITY for payment. At the same time DESIGN PROFESSIONAL will also give written notice to CITY and CONTRACTOR that the Work is acceptable subject to the provisions of Paragraph 14.09.

2. Otherwise, DESIGN PROFESSIONAL will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application to DESIGN PROFESSIONAL. After the presentation to CITY of the Application and accompanying documentation, in appropriate form and substance, including applicable federal and state prevailing wage provisions, and with DESIGN PROFESSIONAL's recommendation and notice of acceptability, the amount recommended by DESIGN PROFESSIONAL will become due and will be paid by CITY to CONTRACTOR in accordance with Laws and Regulations.

#### **14.08 Final Completion Delayed**

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if DESIGN PROFESSIONAL so recommends and CITY concurs, CITY shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of DESIGN PROFESSIONAL, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by CITY for Work not fully completed or corrected is less than the retainage stipulated in the Supplementary Conditions, and if Bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to DESIGN PROFESSIONAL with the Application for Payment. Payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

#### **14.09 Waiver of Claims**

A. The making and acceptance of final payment will constitute:

1. a waiver of all claims by CITY against CONTRACTOR, except claims previously made in writing and still unsettled, or claims arising from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against CITY other than those previously made in writing pursuant to Paragraphs 16.02 and 16.03 and still unsettled.

#### **14.10 Completion of Work by CITY**

A. If CITY must complete the Work, all costs and charges incurred by CITY, together with the cost of completing the Work under the Contract, will be deducted from any monies due or which may become due CONTRACTOR. If such expense exceeds the sum which would have been payable under the Contract, then CONTRACTOR and the surety shall be liable and shall pay to CITY the amount of such excess.

### **ARTICLE 15 SUSPENSION OF WORK AND TERMINATION**

#### **15.01 CITY May Suspend Work**

A. Notwithstanding any other provision of this Contract, at any time and without cause, and at its sole and absolute discretion, CITY, may suspend the Work or any portion of the Work by written notice to CONTRACTOR, which will initially fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed in the notice unless the date is changed by a subsequent written notice from CITY. CONTRACTOR may be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly

attributable to any suspension if CONTRACTOR makes a Claim therefore in accordance with Article 16.

**B.** CONTRACTOR will not be allowed an adjustment in the Contract Price or an extension of the Contract Times if CITY suspends the Work because CONTRACTOR's acts or omissions create or cause an emergency that CITY believes affects the safety or protection of persons, the Work, or property at the Site or adjacent thereto. CITY may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been adequately addressed by CONTRACTOR; however, this right of CITY to stop the Work shall not give rise to any duty on the part of CITY to exercise this right for the benefit of CONTRACTOR, any Subcontractor, Supplier, other individual or entity or any surety or employee or agent of any of them.

#### **15.02 CITY May Terminate for Default**

**A.** CONTRACTOR may be deemed in default and CITY may terminate the services of CONTRACTOR upon the occurrence of any one or more of the following events:

1. CONTRACTOR fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under Paragraph 2.06 and 2.07 as adjusted from time to time pursuant to Paragraphs 6.04, 6.05, 12.02 and 12.03);
2. CONTRACTOR abandons the Work or declares its intention to abandon the Work;
3. CONTRACTOR assigns or attempts to assign its rights or obligations under this Contract or any part thereof to any third party without the prior written consent of CITY;
4. CONTRACTOR fails to make prompt payment duly owing to any subcontractor for Work completed in accordance to the Contract Documents or material supplier for materials delivered for incorporation into the Work within thirty (30) calendar days after payment was due;
5. CONTRACTOR fails to achieve the required dates of substantial and final completion;
6. CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;
7. CONTRACTOR disregards the authority of DESIGN PROFESSIONAL or OWNER; or
8. CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents.

**B.** CITY may, after giving CONTRACTOR (and the surety) seven (7) days written notice and to the extent permitted by Laws or Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the Site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate into the Work all materials and equipment stored at the Site or for which CITY has paid CONTRACTOR but which are stored elsewhere, and finish the Work as CITY may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CITY arising out of or resulting from completing the Work, such excess may be paid to CONTRACTOR. If such costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to CITY within fourteen (14) calendar days of CITY'S demand for payment. When exercising any rights or remedies under this Paragraph CITY shall not be required to competitively bid this work unless required by law.

**C.** Where CONTRACTOR's services have been so terminated by CITY, the termination will not affect any rights or remedies of CITY against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by CITY will not release CONTRACTOR from liability.

**D.** If, after a default termination, it is determined that the CONTRACTOR was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the CITY. The CITY shall then be liable to CONTRACTOR for only those costs enumerated in paragraph 15.03.

### **15.03 CITY May Terminate for Convenience**

**A.** Notwithstanding any other provision of this Contract, upon seven (7) calendar days written notice to CONTRACTOR, CITY may, at its sole and absolute discretion, without cause and without prejudice to any other right or remedy of CITY, elect to terminate the Contract. In such case, CONTRACTOR shall, with thirty (30) calendar days of receiving notice of termination under this paragraph, submit to CITY its statement of costs and expenses and shall be paid:

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

4. for reasonable expenses directly attributable to termination if approved in advance by CITY.

**B.** CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

**C.** CONTRACTOR waives any costs not submitted to CITY pursuant to paragraph 15.03.A.

**D.** CITY shall, within thirty (30) calendar days after receipt of CONTRACTOR's statement, pay CONTRACTOR all amounts it determines are properly determined.

## **ARTICLE 16 CLAIMS AND DISPUTES**

### **16.01 Definition**

**A.** A Claim is a demand or assertion by the CONTRACTOR seeking, as a matter of right, the adjustment of Contract price and/or times with respect to the terms of the Contract.

### **16.02 Written Notice and Burden of Proof**

**A.** Claims must be made by written notice pursuant to Paragraph 17.01. The written notice shall clearly indicate that the CONTRACTOR is making a claim. The responsibility to substantiate Claims shall rest with the CONTRACTOR. No Claim may be made under this Contract except as provided in this Article.

**B.** Certification of Claim: The written notice of Claim shall include the following statement signed by the CONTRACTOR's representative: "The CONTRACTOR certifies that all statements made and the facts set out in this claim are true and correct and that no false records have been submitted in support of this claim." **Strict compliance with this paragraph shall be a condition precedent to the creation, existence or validity of any Claim.**

### **16.03 Time Limits on Claims**

**A.** The CONTRACTOR must give notice to the CITY within fourteen (14) calendar days after the denial of a request for or failure to reach an agreement on a change in Contract Price and/or change in Contract Time pursuant to Article 11 and Article 12 respectively. After the fourteen (14) day period for making Claims has expired, the Claim shall be considered waived.

**B.** The CONTRACTOR shall submit the Claim to the CITY's Representative.

#### **16.04 Continuing Contract Performance**

**A.** Pending final resolution of a Claim, unless otherwise agreed in writing, the CONTRACTOR shall proceed diligently with performance of the Work and the CITY shall continue to make payments in accordance with the Contract Documents. The CITY may, but is not obligated to, notify the Surety of the nature and amount of the Claim.

#### **16.05 Injury or Damage to Person or Property**

**A.** If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts that party is legally liable, written notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding thirty (30) days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter.

#### **16.06 Initial Resolution of Claims and Disputes**

**A.** After the CONTRACTOR has submitted the Claim to the CITY's Representative, the CITY'S Representative and CONTRACTOR'S Representative shall conduct a settlement conference within fourteen (14) calendar days from the date of receipt of the Claim. If the Claim is not settled within seven (7) calendar days following the date of the settlement conference, the CITY'S Representative and the CONTRACTOR's Representative shall state, in writing, following the conclusion of the seven (7) calendar day period, their respective position as to the matters in dispute.

**B.** The CITY'S and CONTRACTOR'S statement of positions shall state all known factual grounds for each party's position. If the dispute remains unresolved at the end of the seven (7) calendar days from submission of the parties' written position statements, the CONTRACTOR shall have the right to proceed with the pursuit of Claims pursuant to paragraph 16.07.

**C.** If a Claim has been resolved, the OWNER will prepare or obtain appropriate documentation.

#### **16.07 Final Resolution of Claims and Disputes**

**A.** All administrative procedures set forth in this contract must first be exhausted before suit is filed.

**B.** If the CITY'S Representative and the CONTRACTOR'S Representative are unable to resolve the dispute pursuant to 16.06, the parties must submit their statements of position to the Director, who shall review the Claim and make a decision within fourteen (14) calendar days.

**C.** Absent fraud, gross mistake or bad faith, the Director's decision shall be final and binding on CITY and CONTRACTOR within fourteen (14) calendar days after issuance. The CONTRACTOR shall give written notice to the CITY stating its intent to submit its Claim to a court of law pursuant to paragraph 17.05.A. within thirty (30) calendar days after notice of Director's decision.

**D.** The time frames for the Director's decision and for CONTRACTOR'S written notice of intent may be tolled by participation in voluntary mediation. Mediator selection and the procedures to be employed in voluntary mediation shall be mutually acceptable to the parties. Costs of the mediator shall be shared equally among the parties participating in the mediation. In no event shall any time frame be tolled more than 30 days for mediation. However, mediation may be employed at any time at the discretion and mutual agreement of the parties.

**E.** If the dispute is not resolved during voluntary mediation, The CONTRACTOR agrees that it will file no suit based on facts or evidentiary materials that were not presented for consideration to the CITY during the mediation process or of which the CONTRACTOR had knowledge and failed to present during the administrative procedures.

### **ARTICLE 17 MISCELLANEOUS**

#### **17.01 Giving Notice**



A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be given by personal delivery, by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice or by confirmed electronic facsimile transmission. Notice is effective on the date of personal delivery, deposit of registered or certified mail, postage prepaid, or confirmed electronic facsimile transmission.

#### **17.02 Computation of Times**

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last calendar day of such period. If the last day of such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

#### **17.03 Cumulative Remedies**

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR and all of the rights and remedies available to CITY and DESIGN PROFESSIONAL hereunder are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

#### **17.04 Survival of Obligations**

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract.

#### **17.05 Controlling Law**

A. This Contract shall be construed and governed in accordance with the laws of the State of Missouri without giving effect to Missouri's choice of law provisions. The CITY and CONTRACTOR: (1) shall submit exclusively to the jurisdiction of the state and federal courts located in Jackson County, Missouri and no other; (2) shall waive any and all objections to jurisdiction and venue; and (3) shall not raise forum non conveniens as an objection to the location of any litigation.



## SUPPLEMENTARY CONDITIONS

Project/Contract Number: 81000812/1541

Project Title: Wastewater Treatment Building – Blue River Annex – Bid #2

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

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

- A. CITY shall furnish to CONTRACTOR up to three (3) copies of the Drawings and Specifications, including Addenda.

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

These Bonds shall remain in effect at least until **three (3) (years)** after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall furnish the following additional Bonds, which shall remain in effect as stated above.

**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-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 ten (10) days prior to Bid date at the following address:

Water Services Department  
4800 East 63<sup>rd</sup> Street  
Kansas City, Missouri 64130  
Attn: Bon Marie Gardner, 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 thirty (30) days prior to the time the item is to be incorporated into the Work. Only CONTRACTOR may submit proposed substitute items, and such items must be submitted to CITY's Representative on the standard City form 01630 - Substitution Request. Acceptance by CITY of any proposed substitute item will be made by Change Order.

**SC-6.10.** 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: Jackson

Work Type: 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 <http://www.dolir.mo.gov/ls/index.htm>.

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 <http://www.dolir.mo.gov/ls/index.htm>. 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 \$150,000.00.

**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 **180 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 **30 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 **One Thousand Five Hundred Dollars (\$1,500)** 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 **Seven Hundred Fifty Dollars (\$750)** 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 or about the 20<sup>th</sup> day of each month. Payments to CONTRACTOR will be made on the basis of ninety-five percent (95%) of the value of the Work satisfactorily completed plus ninety-five percent (95%) of the value of properly stored and insured, unused materials on hand on the Site of the Work. CITY shall retain five percent (5%) of each partial payment until completion and acceptance of the Work covered by the Contract and final payment is due. All Work covered by a payment becomes CITY's property, provided that the Work paid for remains the sole responsibility of CONTRACTOR until all terms and conditions of the Contract have been met.

**SC-14.04.** 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:
  - 1. Site work and Concrete work completed
  - 2. Plumbing and Mechanical work completed
  - 3. Electrical, Instrumentation, and Controls completed
  - 4. Architectural work and finishes installed
  
- B. Items of work, which may be completed after the Work is accepted as Substantially Complete, including the following:
  - 1. Architectural work and finishes touched up
  - 2. All outstanding punch list items from the substantial completion walkthrough

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

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

## SECTION 00830

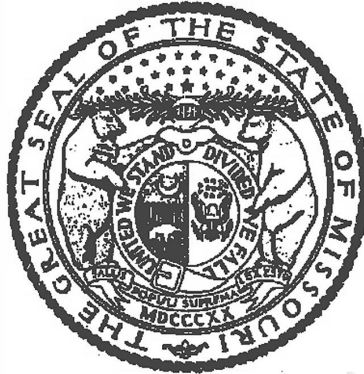
### PREVAILING WAGE

1. Annual Wage Order No. 28
2. **0830.03 Division of Labor Standards Rules & Regulations** are incorporated into and made part of this Contract and are available at <http://s1.sos.mo.gov/cmsimages/adrules/csr/current/8csr/8c30-3.pdf>.

# Missouri

## Division of Labor Standards

### WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

# Annual Wage Order No. 28

Section 048  
**JACKSON COUNTY**

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by

Taylor Burks, Director  
Division of Labor Standards

Filed With Secretary of State: \_\_\_\_\_ **March 10, 2021**

Last Date Objections May Be Filed: **April 8, 2021**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$64.10
Boilermaker	*\$35.84
Bricklayer	\$57.79
Carpenter	\$58.91
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$53.63
Plasterer	
Communications Technician	\$54.21
Electrician (Inside Wireman)	\$64.85
Electrician Outside Lineman	\$69.42
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	*\$35.84
Glazier	\$55.96
Ironworker	\$65.06
<b>Laborer</b>	<b>\$47.93</b>
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$52.40
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$59.15
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$49.71
Plumber	\$72.02
Pipe Fitter	
Roofer	\$56.28
Sheet Metal Worker	\$69.56
Sprinkler Fitter	\$61.52
Truck Driver	*\$35.84
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

\*The Division of Labor Standards received less than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

\*\*The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.



OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$58.86
Millwright	
Pile Driver	
Electrician (Outside Lineman)	*\$35.84
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
<b>Laborer</b>	<b>\$48.78</b>
General Laborer	
Skilled Laborer	
Operating Engineer	\$57.36
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$48.89
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 less than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

\*\*The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

# OVERTIME and HOLIDAYS

## OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, "overtime work" shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

## HOLIDAYS

January first;  
The last Monday in May;  
July fourth;  
The first Monday in September;  
November eleventh;  
The fourth Thursday in November; and  
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.



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# Rules of Department of Labor and Industrial Relations

## Division 30—Division of Labor Standards Chapter 3—Prevailing Wage Law Rules

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**Title 8—DEPARTMENT OF  
LABOR AND  
INDUSTRIAL RELATIONS**

**Division 30—Division of  
Labor Standards**

**Chapter 3—Prevailing Wage Law Rules**

**8 CSR 30-3.010 Applicable Wage Rates for  
Public Works Projects**

*PURPOSE: This rule sets forth applicable wage requirements relative to work performed by workers on public funded projects.*

- (1) All public bodies of Missouri, before advertising for bids or undertaking construction work, must obtain from the department an annual wage order which sets forth the applicable hourly rate of wages (the prevailing wage or the public works contracting minimum wage as provided in section 290.257) in the locality. The rates so determined shall be incorporated in the contract specifications and made a part of those specifications, except that construction contracts of the State Highway and Transportation Commission need not list specific wage rates to apply, but may refer to the wage rates contained in the appropriate General Wage Orders issued by the department, as applicable.
- (2) Request for annual wage orders shall be initiated at least ten (10) calendar days before advertisement of the specifications for the contract for which the determination is sought. An exception from this provision will be made by the department only upon a proper showing of extenuating circumstances. The department has prepared and printed Form No. PW-3 for use in making a request. The form may be secured by writing Division of Labor Standards, PO Box 449, Jefferson City, MO 65102 or by visiting the following website: [https://labor.mo.gov/sites/labor/files/pubs\\_for\\_ms/PW-3-AI.pdf](https://labor.mo.gov/sites/labor/files/pubs_for_ms/PW-3-AI.pdf).
- (3) A project notification form PW-2 must be filed for each separate project by the public body, except the State Highways and Transportation Commission, which will be furnished prevailing wage determinations under General Wage Orders.
- (4) The annual wage order issued by the department contains the current applicable wage rates in the locality at the time the annual wage order is issued. Hours worked during the calendar year are used to set the prevailing wage rates in the annual wage order issued in March of the following year. The department will consider hours submitted for use in its initial determination of the prevailing wage rates to be included in a particular year's wage order only if those hours are received from a contractor, by either paper submission on a form provided by the department or in electronic format, no later than January 31 of that year. Handwritten submissions will not be accepted. For purposes of submitting reportable hours, the term "contractor" shall include a "subcontractor." The department will not include the following hours in the calculation of the annual wage order:
- (A) Hours not readily identifiable as being submitted by a contractor;
- (B) Hours worked by federally-registered apprentices or entry-level workers;
- (C) Hours worked on residential construction projects.
- (5) Section 290.262.8, RSMo, provides that the annual wage order for a particular occupational title may be altered once each year with an incremental increase. A public body shall specify in the call for bids for each contract the applicable hourly rate of wages in the locality for each type of worker as set forth in the annual wage order or any replacement page(s) identifying the annual incremental increase issued by the department for the prevailing hourly rate of wages. The wage rates attached to, and made a part of, the call for bids for a contract shall remain in effect for the duration of that particular contract.
- (6) It should be understood by all interested parties that the certified applicable wage rates determined by the department are minimum wage rates. The contractor may not pay less than the applicable wage rates determined by the department for the project or contract awarded to him/her as set forth in the proposal on which s/he submitted his/her bid. Employees are free to bargain for a higher rate of pay and employers are free to pay a higher rate of pay.
- (7) Each month the successful bid contractors shall submit certified copies of their current payrolls to the contracting public body. The public body, upon receipt of the payrolls on a project, shall keep the payrolls on file for a period of one (1) year from the date of submission of the final payrolls by the contractor. Payroll records shall set out accurately and completely, for each individual, the following information which shall be specifically recorded by occupational title classification and type of worker (journeyman, entry-level worker, or federally-registered apprentice): name and address of each worker, rate of pay, daily and weekly number of hours worked, deduction made, and actual wages paid. The payroll records shall be available at all times for inspection by authorized representatives of the Department of Labor and Industrial Relations.
- (8) The public body shall make examinations of the payrolls and other records of each contractor or subcontractor as may be necessary to assure compliance with the provisions of the law. In connection with those examinations, particular attention should be given to the correctness of classifications and any disproportionate employment of any workers. The examinations shall be of a frequency that may be necessary to assure conformity with the provisions of the law. An examination shall be made after the project has been substantially completed but prior to the acceptance of the affidavit as required by section 290.290, RSMo. If any violation of sections 290.210–290.580, RSMo, is discovered by the inspecting public body, it is their duty under section 290.250, RSMo, to withhold and retain from payments to the contractor all sums and amounts due and owing as a result of any violation. Any violation shall be immediately reported to the Division of Labor Standards at PO Box 449, Jefferson City, MO 65102 or by telephone or electronically.

*AUTHORITY: section 290.240.2, RSMo Supp. 2018.\* Original rule filed Dec. 18, 1975, effective Dec. 28, 1975. Amended: Filed July 24, 1984, effective Nov. 11, 1984. Amended: Filed Aug. 24, 1990, effective April 29, 1991. Emergency amendment filed Sept. 15, 1994, effective Sept. 25, 1994, expired Jan. 13, 1995. Emergency amendment filed Dec. 9, 1994, effective Jan. 14, 1995, expired May 13, 1995. Emergency amendment filed May 1, 1995, effective May 14, 1995, expired Sept. 10, 1995. Amended: Filed May 1, 1995, effective Aug. 30, 1995. Amended: Filed July 17, 1995, effective Jan. 30, 1996. Amended: Filed March 27, 2000, effective Oct. 30, 2000. Amended: Filed Nov. 9, 2000, effective May 30, 2001. Emergency amendment filed Nov. 10, 2015, effective Nov. 20, 2015, expired May 17, 2016. Amended: Filed Nov. 10, 2015, effective April 30, 2016. Emergency amendment filed Nov. 21, 2018, effective Dec. 1, 2018, expired May 29, 2019. Amended: Filed Nov. 21, 2018, effective July 30, 2019.*

*\*Original authority: 290.240, RSMo 1957, amended 1969, 2018.*

*Woodman Engineering Company v. Butler, 442 SW2d 83 (Mo. App. 1969). The function of reviewing court in prevailing wage cases is to decide if the determination of the commission was authorized by law and was supported by competent and substantial evidence upon the whole record. A decision clearly contrary to the evidence should be set aside. However, all pertinent evidence and factors must be considered in determining the applicable prevailing wage.*



*City of Joplin v. Industrial Commission of Missouri*, 329 SW2d 687 (Mo. En Banc 1959). Administrative agencies do not have authority to determine constitutionality of legislation. Determination of prevailing wage earnings by commission must be based upon all current relevant factors.

#### 8 CSR 30-3.020 Definitions

**PURPOSE:** This rule sets forth the definition of certain terms for purposes of issuance and use of annual and general wage orders under the Prevailing Wage Law, sections 290.210–290.580, RSMo and the rules in this chapter.

(1) The term construction of public works generally includes construction activity as distinguished from manufacturing, furnishing of materials or servicing and maintenance work. The term includes, without limitation, the construction of buildings, structures and improvements of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, canals, dredging, shoring, rehabilitation and reactivation of plants, scaffolding, drilling, blasting, excavating, clearing and landscaping. The manufacture or furnishing of materials, articles, supplies or equipment is not construction of public works within the meaning of the Prevailing Wage Law unless conducted in connection with and at the site of construction. The term construction of public works also means all work done in the construction or development of a public works project, including without limitation, altering, remodeling, demolishing existing structures, installation on the site of the construction of items fabricated off-site, painting and decorating, the transporting of materials and supplies to or from the site of the construction by the employees of the construction contractor or construction subcontractor, and the manufacturing or furnishing of materials, articles, supplies or equipment on the site of the construction by persons employed by the contractor or subcontractor.

(2) The term site of the building or construction job means the physical place(s) where the public works are to be constructed, and also means other adjacent or nearby property used by the contractor or subcontractor in that construction which can reasonably be said to be included in the site. Except as otherwise provided in this section, fabrication plants, mobile factories, batch plants, borrow pits, job headquarters, tool yards and the like, are part of the site of the building or con-

struction job provided they are dedicated in a substantial degree to the performance of the public works project, and are so located in proximity to the actual construction location that it would be reasonable to include them. The dedication of seventy-five percent (75%) or more of the output of a fabrication plant, batch plant and the like, to the public works project raises a rebuttable presumption that the facility is part of the site of the building or construction job. The presumption may be rebutted by evidence showing that the facility was established for other legitimate commercial purposes that make the facility useful well after the public works project has been completed. Not included in the site of the building or construction job are permanent home offices, branch plant establishments, fabrication plants and tool yards of a contractor or subcontractor whose location and continuance in operation are determined wholly without regard to a particular public works project. In addition, fabrication plants, batch plants, borrow pits, job headquarters, tool yards and the like, of a commercial supplier or materialman which are established by a supplier of materials for the project before opening of bids and not on the project site are not included in the site of the building or construction job. The permanent, previously established facilities are not a part of the site of the building or construction job, even where the operations for a period of time may be dedicated exclusively, or nearly so, to the performance of a public works project.

**AUTHORITY:** section 290.240, RSMo 1994.\* Original rule filed Aug. 24, 1990, effective April 29, 1991. Amended: Filed July 17, 1995, effective Jan. 30, 1996.

\*Original authority: 290.240, RSMo 1957, amended 1959.

#### 8 CSR 30-3.030 Apprentices and Entry-Level Workers

**PURPOSE:** This rule sets forth the requirements for the payment of wages to apprentices and entry-level workers employed on public works subject to the Prevailing Wage Law.

**PUBLISHER'S NOTE:** The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. This material as incorporated by reference in this rule shall be maintained by the agency at its headquarters and shall be made available to the public for inspection and copying at no more than the actual cost of reproduction. This note applies only to the reference mate-

rial. The entire text of the rule is printed here.

(1) Journeymen's rate of pay shall be paid to all workers employed on public works construction except entry-level workers or apprentices registered and participating in apprentice programs registered with the United States Department of Labor, Employment and Training Administration; and apprentices registered and participating in programs certified by the Secretary of the United States Department of Transportation as promoting equal opportunity in connection with federal-aid highway construction programs. Such workers shall be paid not less than fifty percent (50%) of the applicable wage rate for a journeyman worker under the appropriate occupational title for a specific locality. In calculating the applicable wage rate for a journeyman worker, fringe benefits shall be included.

(2) As set forth in section 290.235, "on-the-job training workers" are defined as follows:

(A) "Federally-registered apprentices" – Workers participating in programs administered by the United States Department of Labor and subject to their specific requirements (See 29 U.S.C. section 50 and 29 C.F.R. 29) and workers participating in programs administered by the United States Department of Transportation and subject to their specific requirements. (See 23 U.S.C. section 113 and 23 C.F.R. 230); and

(B) "Entry-level workers"—Any worker who is not a journeyman and who is not otherwise enrolled in a federally-registered apprenticeship program but is participating in an on-the-job training program provided by the contractor for whom they perform work on a public construction project.

(3) Workers employed on federal-aid highway construction projects may be paid at an apprentice rate of pay if enrolled in an apprenticeship or skill training program which has been certified by the Secretary of the United States Department of Transportation pursuant to 23 U.S.C. 113. In the event the Secretary of Transportation withdraws approval of a program, the contractor will no longer be permitted to pay workers less than the applicable predetermined rate for the work performed until an acceptable program is approved.

**AUTHORITY:** section 290.240, RSMo Supp. 2018.\* Original rule filed Aug. 24, 1990, effective April 29, 1991. Amended: Filed July 17, 1995, effective Jan. 30, 1996. Emergency amendment filed Nov. 21, 2018, effective Dec. 1, 2018, expired May 29, 2019. Amended:



Filed Nov. 21, 2018, effective July 30, 2019.

\*Original authority: 290.240, RSMo 1957, amended 1969, 2018.

### 8 CSR 30-3.040 Classifications of Construction Work

**PURPOSE:** *The Department of Labor and Industrial Relations has the responsibility under section 290.260, RSMo to determine the prevailing hourly rate of wages to be paid to workers engaged in work of a similar character. This rule establishes classifications of construction work for the department to use in determining the prevailing hourly rate of wages for work of a similar character.*

(1) All public works construction, for which the prevailing hourly rate of wages or the public works contracting minimum wage of workers are to be determined, shall be classified as either—

- (A) Building construction; or
- (B) Highway and heavy construction.

(2) Building construction shall mean the following:

(A) Building structures, including modification, additions or repairs, or both, to be used for shelter, protection, comfort, convenience, entertainment or recreation, or for protection of people or equipment;

(B) Buildings at an airport project, such as terminal buildings, freight buildings, and any other construction necessary for the operation of the airport facilities;

(C) Stadiums, athletic fields, dressing rooms, bleachers, and all other buildings needed in connection with an athletic or entertainment facility;

(D) Entire buildings that are built above-ground in connection with highway, subway, or tunnel projects, such as tool stations or housing for mechanical equipment;

(E) Excavation for the building itself, including backfilling inside and outside the building;

(F) Storm and sanitary sewers inside the building and to the curb line;

(G) Work in connection with telephone, electrical, water, oil, gas, or fuel lines, or other utility or communication lines inside a building and to the curb line;

(H) Sidewalks other than those that are poured in connection with a street or road project;

(I) Driveways that are built to serve a building;

(J) Parking lots connected to a building and all structures built as parking facilities;

(K) Retaining walls built in conjunction

with a building project;

(L) Demolition of a building(s) as part of the site preparation for new building construction;

(M) Landscaping of building sites or the planting of all shrubbery that is incidental to building construction as defined in section (2); and

(N) Work on water and wastewater treatment plants within the fence line.

(3) Highway and heavy construction shall mean the following:

(A) Work in connection with roads, streets, parkways, alleys and highways including, but not limited to, grading, paving, curbing, signs, fences, guard rails, bridges, lighting, retaining walls, and landscaping;

(B) Work on viaducts, overpasses, underpasses, drainage projects, aqueducts, irrigation projects, flood control projects, reclamation projects, reservoir filtration and supply projects, water power, duct lines, distribution lines, pipe lines, locks, dikes, levees, revetments projects, excluding work specifically defined as building construction;

(C) Work in connection with underground construction on tunnels and shafts;

(D) Railroad work in its entirety, including elevated railroads;

(E) Main and side sewers;

(F) Work in connection with airports, such as runways, roads, and streets, but excluding that which is listed as building construction;

(G) Work in connection with telephone, electrical, water, oil, gas, or fuel lines, or any other utility or communication lines from the curb line;

(H) Sidewalks when poured incidental to a street or road project;

(I) Parking lots not incidental to a building construction project; and

(J) Demolition of all buildings as part of site preparation for any highway and heavy construction as is otherwise defined in section (3).

**AUTHORITY:** *section 290.240, RSMo Supp. 2018.\* Original rule filed Aug. 24, 1990, effective April 29, 1991. Amended: Filed July 17, 1995, effective Jan. 30, 1996. Emergency amendment filed Nov. 21, 2018, effective Dec. 1, 2018, expired May 29, 2019. Amended: Filed Nov. 21, 2018, effective July 30, 2019.*

\*Original authority: 290.240, RSMo 1957, amended 1969, 2018.

### 8 CSR 30-3.050 Posting of Prevailing Wage Rates

**PURPOSE:** *This rule sets forth the require-*

*ments for the posting of prevailing wage rates on public works projects subject to the Prevailing Wage Law.*

(1) Contractors and subcontractors engaged in public works projects shall post the applicable hourly rate of wages (the prevailing wage or the public works contracting minimum wage as provided in section 290.257, excluding rates on projects for which the engineer's estimate or the bid accepted by the public body for the total project cost is less than seventy-five thousand dollars (\$75,000)) in a dry, accessible place within the field office at the site of the building or construction job. On public works projects for which no field office is needed or established, such as road construction, sewer lines, pipelines, and the like, a contractor/subcontractor may post the applicable hourly rates of wages at the contractor/subcontractor's local office or batch plant, so long as the contractor/subcontractor provides a copy of the prevailing hourly wage rates to any worker upon request. Applicable hourly wage rates must be posted and maintained in a clearly legible condition for the duration of the public works project as provided by law.

**AUTHORITY:** *section 290.240, RSMo Supp. 2018.\* Original rule filed Aug. 24, 1990, effective April 29, 1991. Emergency amendment filed Nov. 21, 2018, effective Dec. 1, 2018, expired May 29, 2019. Amended: Filed Nov. 21, 2018, effective July 30, 2019.*

\*Original authority: 290.240, RSMo 1957, amended 1969, 2018.

### 8 CSR 30-3.060 Occupational Titles of Work Descriptions

**PURPOSE:** *The Department of Labor and Industrial Relations is required to determine the prevailing hourly rate of wages to be paid to each worker engaged in construction on a public works project, relative to the type of work performed by each worker. This rule describes by occupational title the type of work performed in the construction of a public works project in Missouri and sets forth the procedures to be followed in identifying each occupational title utilized on a public works project.*

(1) Each occupational title defines by name the type of work performed in the construction of a public works project. The description of work designated for a particular occupational title is not intended to be jurisdictional in scope or nature, and is not to be construed as limiting or prohibiting workers from engaging in construction work falling within



several occupational titles.

(2) Each occupational title of work description shall be based upon the particular nature of the work performed, with consideration given to those trades, occupations or work generally considered within the construction industry as constituting a distinct classification of work. In determining occupational titles and scope of work definitions, the department shall consider the following:

(A) Collective bargaining agreements;

(B) *Dictionary of Occupational Titles*, as published by the United States Department of Labor; and

(C) Opinions of experts from organized labor and the opinions of contractors and contractor associations as they relate to the custom and usage applicable to the construction industry in Missouri.

(3) Interested parties who wish to submit wage information to be used in establishing the prevailing hourly rate of wages for a particular class or type of work are required to identify the work according to the applicable occupational title of work description set forth in this rule. Hours of work reported by a contractor or subcontractor to the department shall not be used to establish the prevailing hourly rate of wages if the party submitting the hours of work fails to identify the work under one of the occupational titles included in section 290.257.

(4) Any question as to the proper classification of work should be resolved before the work in question is commenced. Interested parties are encouraged to contact the Prevailing Wage Section of the Division of Labor Standards for an interpretation of these rules and for a determination of the appropriate occupational title of work description, relative to the class or type of work to be performed.

(5) The occupational titles and work descriptions for each type or class of work contained herein are valid throughout the entire state of Missouri. Through an objection to a wage order, an interested party may assert that any given description of work, as stated within this rule, does not apply to a specific occupational title(s) and that a different work description should apply to that occupational title(s). The interested party shall have the burden of proving by a preponderance of the evidence the inapplicability of the description of work within that particular occupational title, but shall be afforded the opportunity to do so in a hearing on an objection to the wage order before the Labor and Industrial Relations Commission.

(6) Occupational titles of work descriptions may be obtained from the department by written request to the director of the Division of Labor Standards, PO Box 449, Jefferson City, MO 65102 or by visiting the following website: <https://labor.mo.gov/DLS/PrevailingWage/pwContractors>.

(7) The occupational titles of work descriptions set forth here are as follows:

(A) Asbestos Worker—Applies to workers who apply insulation materials to mechanical systems to reduce loss or absorption of heat, prevent moisture condensation, and to deaden sound and prevent vibration. The workers remove all insulation materials from mechanical systems unless the mechanical system is being scrapped. The work falling within this occupational title of work description includes:

1. The preparation, including the building of enclosures and hanging polyurethane, and physical distribution on the job site of asbestos, cork, plastic, magnesia or similar materials, or other materials used as a substitute, and used as thermal insulation. The manufacture, fabrication, assembling, molding, handling, erection, spraying, pouring, making, hanging, application, adjusting, alteration, repairing, dismantling, reconditioning, corrosion control, and testing of heat or frost insulation, such as asbestos, cork, mineral wall, infusorial earth, mercerized silk, flax, fiber, fire felt, asbestos paper, asbestos curtain, asbestos millboard, fibrous glass, foam glass, styrofoam, polyurethane, polystyrene, metals, plastics, fibrous matter, roving, and resins, and the erection of scaffolding up to fourteen feet (14'), working platform;

2. The covering, including encapsulation, of boilers, tanks, refrigeration units, evaporators, turbines, fittings, valves, ducts, flues, vats, equipment, hot and cold pipes, or any other hot or cold surfaces with the insulation materials listed in this rule, used for the purpose of thermal insulation, fire stoppage, fireproofing, radiator protection, sound deadeners, and the lagging (covering) on piping; and

3. The removal of all insulation materials from mechanical systems, unless the mechanical system is being scrapped, whether they contain asbestos or not (pipes, boilers, ducts, flues, breechings). All cleanup required in connection with this work, shall include the sealing, labeling, and dropping of scrap material into the appropriate containers. (After drop, final disposal is considered to be the class or type of work falling within the occupational title of work description for second semiskilled laborer.);

(B) Boilermaker—Applies to workers who assemble, erect, and repair boilers, tanks,

vats, and pressure vessels according to blueprint specifications, using handtools, portable power tools, and equipment. The work falling within this occupational title of work description includes:

1. Locating and marking of reference points for columns on plates or foundations, using master straightedge, squares, transit, and measuring tape;

2. Using rigging or cranes to lift parts to specified positions;

3. Aligning structures or plate sections, using plumb bobs, levels, wedges, dogs, or turnbuckles;

4. Drilling, reaming, chipping, caulking, and grinding of structures and sections and bolting or welding them together;

5. Setting of drums and headers and installation of tubes;

6. Cleaning up as necessary in connection with this work; and

7. Riveting, acetylene burning, rigging, fitting-up, impact machine operating, unloading and handling of material and equipment where power equipment and rigging are required;

(C) Bricklayers—Applies to workers who prepare, lay, set, bed, point, patch, grout, caulk, cut, fit, plumb, align, level, anchor, bolt, or weld brick, stone masonry, precast aggregate panels, and all types of artificial or imitation masonry. Also, the workers install expansion joint materials in brick, stone masonry, precast aggregate panels, and all types of artificial or imitation masonry. The work falling within this occupational title of work description includes:

1. The unloading of brick, stone masonry, precast aggregate panels, and all types of artificial or imitation masonry where power equipment and rigging are required;

2. The masonry paving and rip-rapping of all types, with or without mortar;

3. The reinforcing of masonry, including placing, tying, and setting of rods;

4. The application of insulation systems and materials, and air and/or vapor barrier systems and materials, by spray, trowel, roller, adhesive, or mechanically fastened in or to all masonry walls;

5. The caulking of abutting masonry openings in masonry walls, expansion joints, and false joints in all types of masonry;

6. The waterproofing of all types of masonry, which shall include installation and application of air and/or vapor barrier systems and materials by spray, trowel, roller, adhesive, or mechanically fastened; and

7. The cleaning, tuckpointing, sandblasting, steam cleaning, and Guniting work on all types of masonry;

(D) Carpenter (which shall include pile driver, millwright, lather, and linoleum layer)—Applies to workers who construct,



erect, install, and repair structures, structural members and fixtures made of wood, plywood, wallboard, and materials that take the place of wood, such as plastic, metals, composites, fiberglass, and Transit sheeting and Cemesto Board, using carpenter hand tools and power tools. The work falling within this occupational title of work description includes:

1. General Carpenter.

A. The layout of buildings or structures on the site or plot. The installation of aluminum expansion joints for buildings and bridge structure as well as concrete strike-off machines.

B. The making and setting of all concrete forms (except curb forms on heavy construction), including establishment of building lines or flow lines (box culverts, bridges) including footing forms. The making of all forms used in tilt-up construction. The layout, installation, and construction for wall forms and footing forms, all block-outs, wood or steel, layout, and installation of all embedded items.

C. The building and handling of scaffolds used by carpenters to work from. All scaffolding, constructed or assembled, fourteen feet six inches (14'6") and higher for normal or specialty use—regardless of purpose.

D. The building of rough wooden structures, such as concrete forms, scaffolds, wooden bridges, trestles, coffer dams, tunnel and sewer support, welding and burning.

E. The selection of specified type of lumber or other materials. Prepare layout, using rule, framing square, and calipers. Mark cutting and assembling lines on materials, using pencil, chalk, and marking gauge. Shape materials to prescribed measurements, using saws, chisels, and planes. Assemble, cut, and shape materials and fasten them together with nails, dowel pins, or glue. Erect framework for structures. Verify trueness of structure with plumb bob and carpenter's level. Apply decorative paneling to walls.

F. The installation of ladders, handrails, walkways, platforms, and gangways made of wood as well as shoring and lagging. Install doors and wood and metal windows and bucks, including hardware (bucks are rough frames in which finished frames are inserted) in building framework and brace them with boards nailed to framework. Install pallet racks and metal shelving. Install subflooring in buildings. Install insulation such as batt, board, safing, thermal, styrofoam, sound attenuation, fiberglass when the installation of the insulation material is not being applied as an integral part of the roofing system. Nail plaster grounds (wood or metal strips) to studding. Fit and nail sheathing on outer walls and roofs on

buildings. Install beams and trusses of wood laminate.

G. The making, handling, and setting of all frames, sash, blinds, trim, and other fixtures (for example, cabinets, bookcases, and benches), when made of wood or any wood substitute. The handling and assembly of chairs, seats, bleachers, and benches and other furniture in theaters, halls, schools, and other places of assemblage on floors of any kind. Install protection screens, chalk boards, toilet partitions (plastic laminate, solid plastic). Caulking of fixtures and countertops including Corian tub and shower enclosures.

H. The installation of wood and metal studs and exterior panels.

I. The handling, cutting, sawing, fitting of drywall (sheetrock), and lead-lined drywall whether for walls, ceilings, floors, soffits, or any use, no matter how installed—nailed, screwed, glued, or otherwise (interior, exterior). Lead-lined drywall is used in X rays to avoid radiation exposure. Install corner guards and wooden and plastic column covers.

J. The handling and installation of acoustical and egg crate ceiling systems in its entirety (hanger wire, grid, molding, tile) whether vertically or horizontally installed.

K. The installation of all builders hardware, including door tracks of every description. The installation of all weather strips. The making, fitting, and hanging of fly screens for doors, windows, and other openings.

L. Installation of wood and hollow metal doors, rollup garage doors, overhead doors or rolling fire doors, automatic doors, channel iron door bucks, glass sliding, and bi-fold doors.

M. The installation of access flooring, computer floors, and raised or elevated floors. Install modular headwall units and laboratory casework and fume hoods;

2. Pile Driver—The work falling within the occupational title of work description for pile driver includes:

A. The handling, layout, driving, cutting, and splicing of wood, metal, or concrete piling regardless of purpose (for example, sheets, I-beams, pile caps, and welding to piling);

B. The assembly, disassembly, and rigging of the pile driving equipment; and

C. The conduct of underwater diving that is incidental to pile driving work;

3. Millwright—Applies to workers who design, build, or repair mills or mill machinery; hoist, dismantle, erect, assemble, line, and adjust all machines used in the transmission of power in buildings, factories or elsewhere; unload machines used in the transmission of power in buildings, factories, or elsewhere, where power equipment and rigging

are required. The work falling within this occupational title of work description includes: the setting of all classes of engines, direct drive motors, dynamos, turbines, generators, and air compressors and pumps. The assembling, setting, and packing of all compressors and pumps. The placing of all pulleys, sheaves, and fly wheels on the listed equipment. The making and setting of all templates and bolts for all machinery requiring same. Drypacking for sole plates. Installation of truck and railroad scales. Installation of trash compactors. Installation of all types of conveyors. The cutting and threading of all bolts. The handling and operating of all acetylene and devices for heating, welding, and cutting when used in connection with millwright work;

4. Lather—Applies to workers who erect horizontal metal framework to which laths are fastened, using nails, bolts, studgun, or a combination of these, drills holes in floor and ceiling, and drives ends of wooden or metal studs into holes to provide anchor for furring or rockboard laths. The occupational title of lather applies to workers who nail, clip, or fasten, all types of wood, wire, and metal laths, plasterboard, wallboard, rockboard, gypsum, sheetrock, and acoustical materials which take the place of same to walls, ceilings, and partitions of buildings to provide supporting base for plaster, fireproofing, or acoustical material. The occupational title of work description for lather applies to workers who erect all metal plastering accessories which are covered or serve as ground, or both, guard, stock, or screed for plaster materials, including wire mesh. The work falling within the occupational title of work description includes:

A. The installing of carrying bars and purlins (pieces of horizontal timber), light iron, and metal furring (thin strips of wood or metal to create air space) of all descriptions, such as rods, channels, flat iron, T-bar, H-bar, and other ceiling bars or systems for the receipt of lath and board;

B. The wiring of plasterer channels to overhead structural framework to provide support for plaster or acoustical ceiling tile; and

C. The nailing of plaster grounds (wood or metal strips) to studding to provide a guide for those workers performing work falling within the occupational title of work description for plasterer;

5. Linoleum Layer—Applies to workers who measure, cut, sew, make-up and seam, tape, fit, lay, and install and seal and wax materials to be cemented, tacked, or otherwise applied to its base, wherever it may be. These materials may be used as shock-absorbing, sound-absorbing, or decorative coverings. With the exception of terrazzo,





magnesite, and latex built-up floors, the materials include oil cloth, matting, linen, carpet, synthetic turf, linoleum, vinyl, plastic, rubber, cork, mastic, asphalt, mastipave, tile, wood tile, interlocking and magnetic tile, chalk and bulletin board, nonslip or abrasive materials, resilient, decorative seamless surface coatings, monolithic coverings (monolithic shall mean all resilient seamless material such as epoxy, polyethylene, plastics and their derivatives, components and systems), and all other resilient coverings on floors, walls, counters, table tops, and ceilings. The work falling within the occupational title of work description includes:

A. The handling of materials at the point of installation;

B. The performing of all necessary preparation and finish work, such as sweeping, scraping, sanding, or chipping dirt and irregularities from base surfaces and filling cracks with putty, plaster, or cement grout to form smooth, clean foundations, drilling holes for sockets and pins;

C. The installing of underlayment, sanding and filling, fitting of metal edgings, metal corners, and caps and fitting devices for attachment of these materials;

D. The spreading of adhesive cement over floor to cement foundation material to the floor;

E. The laying of covering on cement; and

F. The rolling of finished floor to smooth it out and press cement into base and covering;

(E) Cement Mason (which shall include plasterer)—The work falling within this occupational title of work description includes:

1. Cement Mason - Applies to workers who perform work on concrete where finishing tools are used.

A. The setting of screeds, the rodding (buildings), shaping, smoothing, and finishing of the surfaces of freshly poured concrete floors, walls, sidewalks, curbs, steps, and stairways, the finishing of extruded barrier rails or any other concrete surface requiring finishing, using hand tools or power tools, including floats, trowels, screeds, and straightedge.

B. The removing of rough or defective spots from concrete surfaces, using grinder or chisel and hammer and patching holes with fresh concrete or epoxy compound preparatory to sacking.

C. The molding of expansion joints and edges, using edging tools, jointers, and straightedge.

D. The application of penetrating sealer and primer protective coatings to concrete floors and steps when part of the finishing process.

E. The installation of seamless com-

position floors and the installation and finishing of epoxy-based coatings or polyester-based linings to all surfaces, when the coatings or linings are applied by spraying or troweling.

F. The sandblasting or water blasting for architectural finish or preparatory to patching.

G. The cutting of joints with concrete saw for the control of cracks in buildings and sidewalks, driveways, and curbs and gutters contiguous to buildings.

H. The setting of concrete curb, gutter, and sidewalk forms one (1) board high up to twelve inches (12");

2. Plasterer - Applies to workers who apply gypsum, Portland cement, stucco, imitation stone, and kindred materials and products to interior walls, ceilings, and partitions and to exterior walls of buildings, and finish those materials and products.

A. The spreading of plaster over laths, masonry, or any other base, using trowel, and smoothing the plaster with darby and float for uniform thickness;

B. The application of the various manufacturers' brand names of thin coat or plaster veneer;

C. The application of all bonding agents and mastical;

D. The roughing of undercoat with wire or metal scraper to provide bond for succeeding coat of plaster;

E. The application of all malleable plastic materials and epoxy materials;

F. The setting in place of plaster-board, insulation board, styrofoam and bead-board, ground, locks, patent dots, cork plates, brownstone and acoustical tile, fiberglass reinforcement and finished products;

G. The plastering of joints, nail holes, and bruises on wallboard;

H. The grouting and filling of door bucks, runners, and similar installations, in conjunction with plastering operations;

I. The application of scratchcoat, browncoat, and finish coat of plaster to wood, metal or board laths successively to all ceilings and walls when finished with terrazzo or tile, and the application of any plastic material to same;

J. The fireproofing of all building assemblies with plaster materials, sprayed fiberglass or similar materials, whether applied to gypsum, metal lath, or directly;

K. The application of crushed stone, marble, or ceramic chips and broken glass where embedded in plaster, or similar materials;

L. The placing of acoustic blocks with any plastic material, regardless of thickness;

M. The placing, by any method, of plaster or composition caps and ornaments;

N. The creating of decorative textures in finish coat by marking surface of coat with brush and trowel or by spattering it with small stones (stucco) where plastering equipment or materials, or both, are used; and

O. The operation and control of all types of plastering machines, including power trowels and floats;

(F) Communications Technician—Applies to workers who install, inspect, repair, and service electronic and telecommunication systems. The work falling within the occupational title of Communication (Electronic/Telecommunication) Technician includes:

1. Installing, repairing, and servicing of radio, television, and recording systems and devices; systems for paging, intercommunication, public address, wired music, clocks, security and surveillance systems, and mobile radio systems; fire alarm and burglar alarm systems;

2. Wiring of low-voltage surface wiring and wiring in nonmetallic conduits and incidental shielded metallic conduit runs of no longer than ten feet (10') nor larger than one inch (1") when required in conjunction with the work listed in this rule;

3. Installing, repairing, servicing, or a combination of these, of the Main Distribution Frame (MDF) where the permanent outside lines entering a building terminate and where the subscriber's line multiple cabling and trunk multiple cabling originate. It is usually located on the ground floor of a building;

4. Installing, repairing, servicing, or a combination of these, of the Intermediate Distribution Frames (IDF), which provides flexibility in allocating the subscriber's number to the line unit or equipment in the office that is to be associated with the particular line. These frames are located on each floor of a building;

5. Installing, repairing, servicing, or a combination of these, of the subpanels (blocks). The subpanels are connecting devices where large feed cables terminate at the distribution frames;

6. Installing, repairing common equipment or key service unit, or a combination of these. This equipment consists of a back-board assembly and an equipment mounting frame, which are utilized for connecting external telephones;

7. Installing, repairing, servicing of the instruments, terminals, and sets, or a combination of these. This equipment is at either end of a circuit, or at a subscriber's or user's terminal;

8. Installing, repairing, servicing, or a combination of these, of the ancillary or add-on equipment such as bells, buzzers,



speakerphones, headsets, automatic dialers, recorders; and

9. Installing, repairing, servicing of the telephone cable, or a combination of these. Telephone cable includes: network channel service cable; riser cables between floors of a building; distribution cables installed on each floor of a building in the floor or the ceiling, and inside wires between the telephone and the connection to the distribution cable;

(G) Electrician—Applies to workers who are responsible for installation, assembly, construction, inspection, operation, and repair of all electrical work within the property lines of any given property (manufacturing plants, commercial buildings, schools, hospitals, power plants, parking lots). This scope of work shall begin at the secondary site of the transformer when the transformer is furnished by the local utility and the service conductors are installed underground. When service conductors are installed overhead in open air from wooden poles, this scope of work shall start immediately after the first point of attachment to the buildings or structures. The work falling within this occupational title of work description includes:

1. Planning and layout of electrical systems that provide power and lighting in all structures. This includes cathodic protection systems utilized to protect structural steel in buildings and parking structures;

2. All handling, moving, loading, and unloading of any electrical materials, materials used in association with an electrical system, electrical equipment, and electrical apparatus on the job site, whether by hand or where power equipment and rigging are required;

3. Welding, burning, brazing, bending, drilling, and shaping of all copper, silver, aluminum, angle iron, and brackets to be used in connection with the installation and erection of electrical wiring and equipment;

4. Measuring, cutting, bending, threading, forming, assembling, and installing of all electrical raceways (conduit, wireways, cable trays), using tools, such as hacksaw, pipe threader, power saw, and conduit bender;

5. Installing wire in raceways (conduit, wireways, troughs, cable trays). This wire may be service conductors, feeder wiring, subfeeder wiring, branch circuit wiring;

6. Chasing and channeling necessary to complete any electrical work, including the fabrication and installation of duct banks and manholes incidental to electrical, electronic, data, fiber optic, and telecommunication installation;

7. Splicing wires by stripping insulation from terminal leads with knife or pliers, twisting or soldering wires together, and applying tape or terminal caps;

8. Installing and modifying of lighting fixtures. This includes athletic field lighting when installed on stadium structures or supports other than wooden poles, or both;

9. Installing and modifying of all electrical/fiber optic equipment (AC-DC motors, variable frequency drives, transformers, reactors, capacitors, motor generators, emergency generators, UPS equipment, data processing systems, and annunciator systems where sound is not a part thereof);

10. Installing of raceway systems utilizing conduit, conduit bodies, junction boxes, and device boxes for switches and receptacles. This also may include wiring systems utilizing other methods and materials approved by the *National Electrical Code* (MC cable, AC cable, BX, or flexible metal tubing or electrical nonmetallic tubing);

11. Installing of main service equipment, distribution panels, subpanels, branch circuit panels, motor starters, disconnect switches, and all other related items;

12. Installing and wiring of instrumentation and control devices as they pertain to heating, ventilating, air conditioning (HVAC) temperature control and energy management systems, building automation systems, and electrically or fiber optic operated fire/smoke detection systems where other building functions or systems are controlled;

13. Installing conduit or other raceway greater than ten feet (10') when used for the following: fire alarm systems, security systems, sound systems, closed circuit television systems or cable television systems, or any system requiring mechanical protection or metallic shielding (telephone systems);

14. Testing continuity of circuit to insure electrical compatibility and safety of components. This includes installation, inspecting, and testing of all grounding systems including those systems designed for lighting protection; and

15. Removing electrical systems, fixtures, conduit, wiring, equipment, equipment supports, or materials involved in the transmission and distribution of electricity within the parameters of the building property line if reuse of any of the existing electrical system is required. This may include the demolition and removal and disposal of the electrical system;

(H) Elevator Constructor—Applies to workers who assemble and install electric and hydraulic freight and passenger elevators, escalators, dumbwaiters, and moving walks. The work falling within this occupational title of work description includes:

1. The handling, unloading, and hoisting of all equipment to be assembled or installed by workers performing work within this occupational title of work description,

from the time that equipment arrives at, or near the building site;

2. The wrecking or dismantling of elevator plants, to include elevators, escalators, dumbwaiters, moving walks, and all other equipment to be reused and assembled or installed by workers performing work within this occupational title of work description;

3. The sinking, drilling, boring, digging cylinder wells, or backfilling for hydraulic lifts, hydraulic elevators, or screw lifts;

4. The layout, erecting and assembling of all elevator equipment (for example, electric, hydraulic, steam, belt, compressed air, and hand-powered elevators; dumbwaiters, residence elevators, parking garage elevators), and the assembly of all escalators, moving walks and link belt carriers;

5. The erecting and assembly of all theater stage and curtain equipment and guides and rigging to them, organ consoles, and orchestra elevators;

6. The installing of all wiring, conduit, and raceways from the first point of attachment of main feeder terminals on the controller to other apparatus and operating circuits;

7. The operating of temporary cars; and

8. The installing of all elevator enclosures, fronts, fascias, sills, frames, and bucks;

(I) Glazier—Applies to workers who select, cut, prepare, handle, install, or remove all window glass, plate, and all other types of glass, including structural glass, mirror glass, tempered and laminated glass, safety or protection glass, all types of insulating glass units, all plastics or other similar materials when used in place of glass and when set or glazed with putty, moulding rubber, cement, lead, and all types of mastic, or other materials used in place of same. The workers performing work within this occupational title of work description install these materials in windows, louvers, doors, partitions, skylights, and on building fronts, walls, ceilings and tables, whether the materials are set in wood, stone, cement, or metal of all types. The work falling within the occupational title of work description includes:

1. The installing of mirrors of all types;

2. The marking of an outline or pattern on glass and cut glass with a glasscutter;

3. The breaking off of excess glass by hand or with a notched tool;

4. The fastening of glass panes into wood sash with glazier's points, and the spreading smooth of putty around the edge of panes with a knife to seal joints;

5. The installing of metal window and door frames into which glass panels are to be fitted or sliding windows. The bolting of metal hinges, handles, locks, and other hardware to prefabricated glass doors;



6. The installing of mirror or structural glass on building fronts, walls, ceilings or tables, using mastic, screws, or decorative moulding;

7. The installing of metal-framed glass enclosures for showers, bathtubs, and skylights; and

8. The installing, cutting, and removal of all window glass, plate, and all other types of glass, including structural glass, mirror glass, tempered and laminated glass, safety or protection glass, all types of insulating glass units, all plastics or other similar materials when used in place of glass and when set or glazed with putty, molding rubber, cement, lead, and all types of mastic, or other materials used in place of same;

(J) Ironworker—Applies to workers who perform work in connection with field fabrication, erection, or both, installation, removal, wrecking, and dismantling of structural, architectural, and reinforcing iron and steel, ornamental lead, bronze, brass, copper, and aluminum, and plastics or other materials when used in place of them. The work falling within the occupational title of work description includes:

1. Structural. The unloading, erecting, bolting-up, plumbing-up, welding, and installing of structural steel, including any field fabrication;

2. Reinforcing. The unloading, carrying, placing, and tying of all concrete reinforcing, such as re-bar, wire mesh, expanded metal or post tensioning cable (including the tension process) or prestress cables when installed on the job site;

3. Rigging. The unloading, moving, handling, placing, and setting of electrical machinery and equipment when rigging or power equipment, or both, is used (with the exception of setting of electric motors). The assembly and erection of radio and television and other structural steel towers (with the exception of electrical transmission towers). The unloading, handling, moving, and placing of machinery to be assembled or dismantled, erected, or installed to its approximate position (over the anchor bolts);

4. Windows. The installation of metal windows (with the exception of store fronts display windows), curtain walls, and metal panels. The caulking of metal-to-metal joints and metal-to-brick;

5. Doors. The erection of curtain type doors (overhead rolling-type doors), heavy industrial doors when made of metal, fire doors, and exterior metal hinged doors that carry a fire underwriters label are erected by iron workers;

6. Sheeting and decking. The installation of sheeting which is attached to metal framework including metal floor decking;

7. Metal buildings. The erection and

installation of structural steel and sheet metal packaged buildings when they come in a package unit, such as Butler, Delta, Varco Prudent, or other name brand packaged buildings. The installation of all doors, windows, and insulation (when installed in conjunction with sheeting) in the packaged buildings. The installation of metal siding and metal roof decking, regardless of the fastening method or the object to which it is fastened;

8. Elevators. The installation of elevator doors for gates manually operated and all elevator enclosures, fronts, fascias, sills, frames, and bucks;

9. Precast. The unloading and installation/erection of precast bridge girders, single T's, double T's, top panels, and tilt-up slabs; and

10. Other. The installation of all catwalks, stairways, and hand rails made of aluminum, bronze, or any type of metal, glass or plastic. The installation of ornamental iron, such as revolving doors, gates, handrails, window grills, jail and cell work, and chain link fences. The installation of dry storage bins, hoppers, chutes, and conveyors where sand ore, coal, or any dry component is stored or transferred. The erection, installation, removal, wrecking, and dismantling of bridges, viaducts, cableways, tramway, mono-rail transportation systems. The erection, installation, removal, wrecking, and dismantling of locks, gates, metal forms, railings (including pipe). The erection, installation, removal, wrecking, and dismantling of frames in support of boilers. The installation of metal siding and metal roof decking, regardless of the fastening method, or the object to which it is fastened. The handling, burning, welding, and tying of all materials used to reinforce concrete structures. The installation and erection of TV and microwave towers, self-supporting towers, or guy towers. The installation of metal guardrails with metal posts and highway signage;

(K) General Laborer (including first semi-skilled laborer and second semi-skilled laborer)—Consists of providing routine manual labor. This work encompasses several sub-classifications, with the title and work description considered in light of whether the public works project pertains to building construction or heavy/highway construction.

1. Building construction. The subtitles falling within the occupational title of work description for laborer, as applicable to building construction, are as follows:

A. Laborer. The work falling within this subtitle of work description includes:

(I) Being included in one (1) of the following categories: flagmen, heaters, material plant man, carpenter tender, landscaper, signalman, wrecker (old/new structures),

form handler, or posthole digger;

(II) Cleaning and clearing of all debris for all crafts, loading and unloading, conveying, distributing, construction material by hand and collecting and hoisting debris, backfilling, grading, and landscaping by hand;

(III) Covering of tanks, structures, and material piles with tarpaulins or other materials. Cleaning of masonry and other type walls and windows. Signaling and hoisting concrete buckets and for all other material handled by workers falling within the occupational title of work description for laborer;

(IV) Providing drinking water. Handling and cleaning of concrete chutes. Cleaning of concrete spills and chipping where hand tools are required. Performance of work necessary in remedying defects in concrete caused by leakage, bulging, sagging, or shifting of forms when finishing tools are not used. Jackhammer and paving breaker, air compressors, motor buggies, pumps (removal of water), except set-up men and nozzle men, chipping tool operator, concrete mixer operator (up to and including two- (2-) bag capacity); and

(V) Laying nonpressurized pipe for downspout drain lines, header lines, or laying of nonpressurized conduit, or a combination of these, for the carrying of storm water, waste, sewage, gravity flow lines, catch basins and manholes, effluent lines, originating outside the building and all those lines originating inside the building at the first Y, T, or connection outside the building;

B. First semiskill laborer. The work falling within this subtitle of work description includes: hod-carriers, plasterers, and cement mason tenders (who assist bricklayers, plasterers, and cement masons). The mixing, packing, wheeling, and tempering of mortar and fire clay. The mixing, handling and conveying of all other materials used by bricklayers, plasterers, and cement masons (for example, brick, tile, stone and cast stone), whether done by hand or using a forklift (walk behind or similar types). Building of scaffolds, trestles, boxes, and swinging staging for bricklayers, plasterers, and cement masons; and

C. Second semiskill laborer. The work falling within this subtitle of work description includes: concrete pump set-up men and nozzle men, tile layers and bottom men, on sewers and drains, cutting torch, and burning bar (demolition), trench, or pier holes twelve feet (12') or over, wagon drill, air track or any mechanical drill, powder man, tamper, one hundred pounds (100 lbs.) or over, laborers working for mechanical and electric contractors (including but not limited to digging of all trenches, ditches, holes, paving of concrete, and cleaning of all trash),



paving breaker, jackhammer and vibrator, laser beam man for sewer, grade checker for roads and railroads, asbestos removal (except mechanical systems that are not being scrapped and any type of roofing where the roof is to be relaid), hazardous waste removal, disposal work, or any combination of these.

2. Heavy/highway construction. The subtitle falling within the occupational title of work description for general laborer, as applicable to heavy/highway construction, are as follows:

A. Laborer. The work falling within this subtitle of work description includes: carpenters tenders, salamander tenders, dump man, ticket takers, flagman, loading trucks under bins, hoppers and conveyors, track men, cement handler, dump man on earth fill, Georgia buggy man, material batch hopper man, spreader on asphalt machine, material mixer man (except on man holes), coffer dams, riprap pavers—rock, block, or brick, signal man for materials handled by laborers, scaffolds over ten feet (10') not self-supported from ground up, skipman on concrete paving, wire mesh setters on concrete paving, work in connection with non-pressurized pipelines, such as nonpressurized sewer, water, gas, gasoline, oil, drainage pipe, conduit pipe, tile, and duct lines and other nonpressurized pipelines; power tool operator; work performed by hand in connection with hydraulic or general dredging operations, form setters (curb and gutter), puddlers (paving only), straw blower nozzle man, asphalt plant platform man, chuck tender, crusher feeder, men handling creosote ties or creosote materials, men working with and handling epoxy material(s), topper of standing trees, feeder man on wood pulverizers, board and willow mat weavers and cable tiers on river work, deck hands, guardrail and temporary signs, pile dike and revetment work, all laborers working on underground tunnels less than twenty-five feet (25') where compressed air is not used, abutment and pier hole men working six feet (6') or more below ground, men working in coffer dams for bridge piers and footings in the river, Barca tamper, Jackson or any other similar tamp, cutting torch man, liners, curb, gutters, ditchliners, hot mastic kettleman, hot tar applicator, hand blade operators and mortar men on brick or block manholes, rubbing concrete, air tool operator under sixty-five pounds (65 lbs.), caulker and led man, chain or concrete saw under fifteen horsepower (15 HP). The unloading, handling, and carrying of concrete reinforcing bars, by hand, to the areas in which they are used, wrecking, stripping, dismantling, cleaning, moving, and oiling of all concrete forms; digging and laying sewer tile; and

B. Skilled laborer. The work falling within this subtitle of work description includes: vibrator man, asphalt raker, head pipe layer on sewer work, batterboard man on pipe and ditch work, cliff scalers working from Bosun's chairs, scaffolds, or platforms on dams or power plants over ten feet (10') high, air tool operator over sixty-five pounds (65 lbs.), stringline man on concrete paving and the like, sandblast man, laser beam man, wagon drill, churn drill, air track drill, and all other similar type drills, jackhammers, and other pneumatic hammers and tampers, Gunit nozzle man, pressure grout man, screed man on asphalt, concrete saw fifteen (15) HP and over, grade checker, stringline man on electronic grade control, manhole builder, dynamite man, powder man, welder, tunnel man waterblaster—one thousand pounds per square inch (1000 psi) over, asbestos (except mechanical systems that are not being scrapped), hazardous waste removal, disposal, or any combination of these;

(L) Mason (which shall include marble mason, marble finisher, terrazzo worker, terrazzo finisher, tile setter, and tile finisher).

1. Marble Mason-Terazzo Worker—The work falling within the occupational title of work description for Marble Mason-Terazzo Worker includes:

A. The installing of marble, mosaic, venetian enamel, and terrazzo; the cutting and assembling of mosaics and art ceramics; the casting of all terrazzo on the job site; all rolling of terrazzo work;

B. The preparing, cutting, layering, or setting of metal, composition, or wooden strips and grounds on all bedding above concrete floors or walls; and the laying and cutting of metal, strips, lath, or other reinforcement, where used in terrazzo work;

C. The installing of cement terrazzo, magnesite terrazzo, dex-o-tex terrazzo, epoxy matrix terrazzo, exposed aggregate. Rustic or rough wash of exterior or interior of buildings. The mixing or applying of any other kind of mixtures of plastics composed of chips or granules of marble, granite, blue stone, enamel, mother of pearl, quartz ceramic colored quartz, and all other kinds of chips or granules when mixed with cement, rubber, neoprene, vinyl, magnesium chloride, or any other resinous or chemical substances used for seamless flooring systems. The applying of binding materials when used on walls, floors, ceilings, stairs, saddles, or any other part of the interior or exterior of the building, or other work not considered a part of the building such as fountains, swimming pools;

D. The finishing of cement floors where additional aggregate of stone is added by spreading or sprinkling on top of the fin-

ished base and troweled or rolled into the finish and then the surface ground by grinding machines (When no additional stone aggregate is added to the finished mixture, even though the surface may be ground, the work falls within the occupational title of work description for cement masons.); and

E. The carving, cutting, and setting of all marble, slate, including slate backboards, stone, alabaster, carrara, sanionyx, vitrolite, and similar opaque glass, scagliola, marble-ithic, and all artificial, imitation, or case marble of whatever thickness or dimension. This shall apply to all interior work, such as sanitary, decorative, and other purposes inside of buildings of every description wherever required, including all polish, honed, or sand finish.

2. Marble Finisher—The work falling within the occupational title of work description for Marble Finisher includes:

A. The preparation of floors and/or walls by scraping, sweeping, grinding, and related methods to prepare surface for Marble Mason installation of construction materials on floor and/or walls; the movement of marble installation materials, tools, machines, and work devices to work areas; the erection of scaffolding and related installation structures;

B. The movement of marble slabs for installation; the drilling of holes and the chiseling of channels in edges of marble slabs to install wall anchors, using power drill and chisel; the securing of marble anchors to studding, using and covering ends of anchors with plaster to secure anchors in place;

C. The supply and mixture of construction materials for Marble Mason; the mixture of grout, as required, following standard formulas and using manual or machine mixing methods; the application of grout to installed marble; the movement of mixed mortar or plaster to installation area, manually or using wheelbarrow;

D. The removal of excess grout, using wet sponge; the cleaning of installed marble surfaces, work and storage areas, installation tools, machinery, and work aids, using water and cleaning agents;

E. The modification of mixing, material moving, grouting, polishing, and cleaning metal pieces, using a torch, spatula, and heat sensitive adhesive and filler;

F. The removal of marble installation materials and related debris from immediate work area; the storing of marble, installation material tools, machines, and related items; and

G. The provision of assistance to Marble Mason with the following tasks: bending or forming of wire to form metal anchors, using pliers; inserting anchors into holes of marble slab; securing anchors in



place with wooden stakes and plaster; selecting marble slab for installation following numbered sequences or drawings; grinding and polishing marble, using abrasives, chemical and/or manual, in machine grinding and/or polishing techniques, under Marble Mason's direction; the moving and positioning of marble.

3. Terrazzo Finisher—The work falling within the occupational title of work description for Terrazzo Finisher includes:

A. The preparation of floors and/or walls by scraping, sweeping, grinding, and related methods to prepare surface for Terrazzo Worker installation of construction materials on floors, base, and/or walls; the moving of terrazzo installation materials, tools, machines, and work devices to area, manually or using wheelbarrow;

B. The supply and mixture of construction materials for Terrazzo Worker; the preparation, mixture by hand, mixture by mixing machine, or transportation of pre-mixed materials and the distribution with shovel, rake, hoe, or pail, of all kinds of concrete foundations necessary for mosaic and terrazzo work; the dumping of mixed materials that form base or top surface of terrazzo into prepared installation site, using wheelbarrow; the measuring of designated amounts of ingredients for terrazzo or grout, using graduated containers and scale, following standard formulas and specifications, and the loading of portable mixer using proper means of transport; the mixture of materials according to experience and requests from Terrazzo Worker;

C. The spreading of marble chips or other material over fresh terrazzo surface and the pressing of the material into terrazzo by use of a roller; the application of grout finishes to surfaces of installed terrazzo; the spreading of grout across terrazzo to finish surface imperfections, using trowel; the installation of grinding stones in power grinders, using hand tools; the fine grinding and polishing of the surface of terrazzo, when grout has set, using power grinders; the application of curing agent to installed terrazzo to promote even curing, using brush or sprayer; the cutting of grooves in terrazzo stairs, using power grinder, and the filling of grooves with nonskid material;

D. The modification of mixing, grouting, grinding, and cleaning position and the securing of moisture membrane and wire mesh prior to pouring base materials for terrazzo installation;

E. The washing of the surface of polished terrazzo, using cleaner and water, and the application of sealer, according to manufacturer specifications, using brush; the cleaning of the installation site, and storage areas, tools, machines, and equipment; the

removal of Terrazzo Worker materials and related debris from immediate work area; and

F. The provision of assistance to Terrazzo Worker with the following tasks: grinding surfaces of cured terrazzo; using power grinders.

4. Tile Setter—The work falling within the occupational title of work description for Tile Setter includes:

A. The application of tile to floors, walls, ceilings, stair treads, promenade roof decks, garden walks, swimming pools, and all places where tiles may be used to form a finished surface for practical use, sanitary finish, or decorative purpose. (Tile includes all burned clay products, as used in the tile industry, either glazed or unglazed, all composition materials; all substitute materials in single units up to and including, fifteen inches by twenty inches by two inches (15" × 20" × 2") (except quarry tiles larger than nine inches by eleven inches (9" × 11")) and all mixtures in the form of cement, plastics, and metals that are used as a finished surface.);

B. The cutting and shaping of tile with saws, tile cutters, and biters; and

C. The positioning of tile and tapping it with a trowel handle to affix tile to plaster or adhesive base.

5. Tile Finisher—The work falling within the occupational title of work description for Tile Finisher includes:

A. The preparation of floors and/or walls by scraping, sweeping, grinding, and related methods for Tile Setter to install construction materials on floors and walls; the movement of tiles, tile setting tools, and work devices from storage area to installation site manually or using wheelbarrow;

B. The supply and mixture of materials for Tile Setter; the supply and mixture of construction materials for Tile Setter; the mixture of mortar and grout accordingly to standard formulas and request from Tile Setter using bucket, water hose, spatulas, and portable mixer; the modification of mixing, grouting, grinding, and cleaning procedures according to type of installation or material used; the supply to Tile Setter of mortar, using wheelbarrow and shovel; the application of grout between joints of installed tile, using grouting trowel; the application of grout; the cutting of installed tile;

C. The removal of excess grout from tile joints with a sponge and scraping of corners and crevices with a trowel; the application of caulk, sealers, acid, steam, or related agents to caulk, seal, or clean installed tile, using various application devices and equipment;

D. The wiping of surfaces of tile after grouting to remove grout residue and polish tile, using non-abrasive materials; the removal of Tile Setter materials and related

debris from immediate work area; the cleaning of installation site, mixing and storage tools, and equipment, using water and various cleaning tools; the storing of tile setting material machines, tools, and equipment; and

E. The provision of assistance to Tile Setter to secure position of metal lath, wire mesh, felt paper, Dur/rock or wonderboard prior to installation of tile;

(M) Operating Engineer (which shall include operating engineer group I, operating engineer group II, operating engineer group III, operating engineer group III-A, operating engineer group IV, and operating engineer group V)—Applies to workers who perform work falling within the occupational title of work description for operating engineer/portable and hoisting operator, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment. This occupational title encompasses several subclassifications, with the title and work description considered in light of whether the public works project pertains to building construction or heavy/highway construction.

1. Building construction. The subtitles falling within the occupational title of work description for operating engineer, as applicable to building construction, are as follows:

A. Group I—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as follows: crane (for example, crawler or truck); dragline—clam shell—gradall; Derrick (all types); kimmer scoop; power shovel or backhoe over one (1) cubic yard; pile driver (for example, land or floating); Whirley; mechanic and welder; hydraulic, self-propelled crane; stinger or cherry picker crane; switch boat; concrete portable plant/concrete mixer paver; cableways;

B. Group II—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as follows: asphalt paver and spreader/concrete spreader; asphalt plant mixer operators; asphalt plant operator; backfillers; back hoe (under one (1) cubic yard); Barber-Green loader (similar type); blade—power, all types; boats—power; boilers; boring machine (all types, including tunnel boring); brooms—power operated (all types); concrete saw (self-propelled); chip spreader (front man); clef plane operators; combination concrete hoist and mixer such as mix or mobile; crab—power operated; crusher rock; ditching machine; dozer/dredges;



finishing machine; firemen on rigs; flex plane; floating machine; form grader; greaser; hoist operator (all types); hopper—power operated; hydra hammer (all types); Lad-A-Vator—similar type; loaders—all types, including skid-steer (for example, Bobcat); locomotives (all types); curb finishing machine; mucking machine; orange peels; pumps (all types); push cats; rollers (all types); scoops (all types except skimmer scoop); self-propelled rotary drill; air compressors (all types); side boom; siphons, jets, and jennies; welding machine; subgrader; testhole machine; throttle man tractors over fifty (50) HP; air tugger with air compressor; anchor placing barge; Ahoy force feeder loader (self-propelled); bull float; pipe cleaning/wrapping machine; conveyor; heaters, fuel fired with forced air; quadtrack; tie tamper; vibrating machine; well drilling machine; forklift (except masonry forklift);

C. Group III—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as follows: tractors (under fifty (50) HP); distributor (bituminous); scissor lift; small machine (operator); mud jack; wench truck operator; pug mill operator; elevator-push button; A-frame truck; mixers; oilers;

D. Group III-A—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as a masonry forklift;

E. Group IV—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as a self-propelled floor sweeper; and

F. Group V—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as follows: elevator—auto; air pressure oiler; air pressure engineer.

2. Heavy/highway construction. The subtitles falling within the occupational title of work description for operating engineer, as applicable to heavy/highway construction, are as follows:

A. Group I—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as follows: asphalt finishing machine and trench; widening spreader;

asphalt plant console operator; autograder; automatic slipform paver; backhoe; blade operator (all types); boat operator (all types); boilers—two (2); central mix concrete plant operator; clamshell operator; concrete mixer paver; crane operator; Derrick or Derrick trucks; ditching machine; dozer operator; dragline operator; dredge booster pump; dredge engineman; dredge operator; drill cat with compressor mounted on cat; drilling or boring machine rotary self-propelled; high-loader including skid steer (for example, Bobcat); hoisting engine—two (2) active drums; launchhammer wheel; locomotive operator—standard gauge; mechanics and welders; mucking machine; piledriver operator; Pitman crane operator; push cat operator; quadtrack; scoop operator—all types; shovel operator; sideboom cats; skimmer scoop operator; trenching machine operator; truck crane;

B. Group II—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as follows: A-frame truck; asphalt hot mix silo; asphalt plant fireman, drum or boiler; asphalt plant mixer operator; asphalt plant man; asphalt roller operator; backfiller operator; Barber-Greene loader; chip spreader; concrete mixer operator, skip loader; concrete plant operator; concrete pump operator; crusher operator; dredge oiler; elevating grader operator; forklift; greaser—fleet; hoisting engine—one (1); locomotive operator—narrow gauge; multiple compactor; pavement breaker; power-broom—self-propelled; power shield; roter; side discharge concrete spreader; slip form finishing machine; stumpcutter machine; throttle man; tractor operator—over fifty (50) HP; winch truck;

C. Group III—This subtitle applies to workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as follows: boilers—one (1); chip spreader (front man); churn drill operator; clef plane operator; concrete saw operator self-propelled; curb finishing machine; distributor operator; finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; roller operator, other than high-type asphalt; screening and washing plant operator; siphons and jets; sub-grading machine operator; spreader box operator, self-propelled (not asphalt); tank car heater operator—combination boiler and booster; tractor operator fifty (50) HP or less; Umac, Ulric, or similar spreader; vibrating machine operator, not hand;

D. Group IV—This subtitle applies to

workers who operate, monitor, and control, repair, modify, assemble, erect, oil, service each or all electrically or electronically, hydraulically, or any power-operated equipment set forth as an oiler or oiler-driver (fireman—rig; maintenance operator);

(N) Outside- lineman, lineman operator, groundman, lineman tree trimmer, groundman tree trimmer, and any combination thereof.

1. Outside-lineman—Applies to workers who erect and repair transmission poles (whether built of wood, metal, or other material), fabricated metal transmission towers, outdoor substations, switch racks, or similar electrical structures, electric cables, and related auxiliary equipment for high-voltage transmission and distribution powerlines used to conduct energy between generating stations, substations, and consumers. The work (overhead and underground) falling within this occupational title of work description includes:

A. Construction, repair, or dismantling of all overhead and underground electrical installations. The handling and operation of all equipment used to transport men, tools, and materials to and from the job site. The framing, trenching, digging, and backfilling of vaults, holes and poles, and anchors (by hand or mechanical equipment), guying, fastening to the stub-in on concrete footings or pads, assembling of the grillage, grounding of all structures, stringing overhead wire, installing underground wire, splicing, and installation of transformers;

B. Construction and repair of highway and street lighting and traffic signal systems, cathodic protection systems, and ball field lighting systems;

2. Lineman operator—Operates equipment used on the outside line portion of a project. The lineman operator assists linemen in the performance of their work but does not climb or work out of any type of aerial lift equipment. The lineman operator does not perform any work that requires the use of hand tools;

3. Groundman—Work performed on the ground to assist the journeymen outside line construction/lineman on work not energized. Groundmen use jack hammers, air drills, shovels, picks, tamps, trenching equipment, and other such tools for excavating and/or compacting dirt or rock on the outside line portion of a project but do not use hand tools;

4. Lineman tree trimmer—Trimming and removal of trees, stumps, limbs, brush, and other related tasks in and around electrical systems by use of chainsaws, pruners, pole saws, and hand saws only when specifically required to provide clearance and right-of-way preparation for installation of overhead or underground high-voltage electric



utility lines, and excluding the clearance of right-of-ways related to heavy-highway construction or other public projects not directly related to the installation of electrical utility lines. Lineman tree trimmer work may be performed on the ground and in the air; and

5. Groundman tree trimmer—Assists the lineman tree trimmer in the performance of their work using rakes, chainsaws, chippers, and industrial mowers in and around electrical systems only when specifically required to provide clearance and right-of-way preparation for installation of overhead or underground high-voltage electric utility lines, and excluding the clearance of right-of-ways related to heavy-highway construction or other public projects not directly related to the installation of electrical utility lines. Groundman tree trimmer work is only performed on the ground;

(O) Painter—The work falling within the occupational title of work description for painter includes:

1. Preparation of surfaces. The washing, cleaning, pointing, and taping of drywall, regardless of material used, and smoothing of surfaces, using sandpaper, brushes, or steel wool. The removal of old paint or other coatings from surfaces, using paint remover, scraper, wire brushing, sandblasting, water blasting, liquid steam, or by any other similar process. The filling of nail holes, cracks, and joints with putty, plaster, or other fillers;

2. Color matching and mixing. The application of paint, varnish, stain, enamel, lacquer, vinyl, wallpaper, and other materials of whatever kind of quality applied to walls or ceilings with paste or adhesive, using brushes, spray gun (spray painter), or paint rollers. The application of polyurethane elastomers, vinyl plastics, neoprene, resin, polyester, and epoxy as waterproofing or protective coatings to any kind of surface (except roofs) when applied with brushes, spray guns, or rollers;

3. Texturing and decorating. The erecting of scaffolding or setting up of ladders to perform the work above ground level. The paperhanging of walls and ceilings with decorative wall coverings made of fabric, vinyl, or paper. The preparing of the surface to be covered by applying sizing, which seals the surface and makes the covering stick better. The removal of the old covering by soaking, steaming, or applying solvents. The patching of holes and other imperfections before applying the new wall covering. The measuring of the area to be covered; the cutting of the covering into strips of the proper size, the checking of the covering for flaws and the examination of the pattern so it can be matched when the strips are hung. The preparation of paste or other adhesives according to manufacturers' directions, and the brush-

ing or rolling it on the covering. The placing of the strips on the wall or ceiling, to match adjacent patterns. The smoothing of the strips to remove bubbles and wrinkles; the trimming of the top and bottom with a razor blade; and the painting or taping of highway striping, or both; and

4. Cleanup. The cleanup of tools and equipment required in connection with work falling within this occupational title;

(P) Plumber (which shall include pipe fitter).

1. General Plumber—Applies to workers who install and repair domestic potable water lines, gravity waste disposal systems inside the curb or fence lines, plumbing fixtures such as: bathtubs, sinks, and toilets—and appliances such as, dishwashers and water heaters. The work falling within the occupational title of work description for plumber includes:

A. Assembling and installing piping systems, fixtures and equipment for the transportation of domestic water and sewage. Piping systems installed in structures (for example, buildings, industrial plants) to the first Y, T, or connection located outside the building;

B. Cutting, threading, and bending pipe. Joining pipes by use of screws, bolts, fittings, solder, welding brazing, and caulking or any other method of making joints in the plumbing industry;

C. Assembling, installing, and repairing valves, pipe fittings, and pumps. Testing the piping system. Installing and repairing plumbing fixtures, such as sinks, bathtubs, water heaters, and water softeners; and

D. Cutting holes in floors and walls for pipes with point and hammer, core drill, or both.

2. Pipe Fitter—Applies to workers who fabricate, install, and repair piping systems to include: water and waste processing systems; heating and air-conditioning systems, pneumatic controls, and pneumatic delivery systems; powerhouse and all pressurized piping systems; gas, oxygen systems; gasoline systems not for public sale. The work falling within this occupational title of work description includes:

A. Piping systems installed in structures (for example, buildings, industrial plants, and the like);

B. Cutting, threading, and bending pipe. Joining pipes by use of screws, bolts, fittings, solder, welding, and caulking, or any other method of making joints in the pipefitting industry;

C. Assembling, installing, and repairing valves, pipe fittings, and pumps. Testing the piping system. Cutting holes in floors and walls for pipes with point and hammer, core drill, or both;

D. Installing of distribution lines (for example, water mains, sewer mains, oil and gas lines);

E. Welding of steel pipe joints and joining pipes with screws, bolts, fittings, solder, caulking, or any other method for making joints in the industry; and

F. Joining ductile iron and plastic pipes by using any method for making joints in the industry, when the pipe will be under pressure;

(Q) Roofer—Applies to workers who apply and install any and all types of roofing materials, other than sheet metal. The work falling within this occupational title of work description includes:

1. The installation of slate and tile and all substitute materials taking the place of slate and tile used for roofing including flat or promenade slate, with necessary metal flashing to make water-tight;

2. The cementing in, on, or around slate and tile roofs. The laying of felt or paper beneath the slate and tile. The dressing, punching, and cutting of all roof slate or tile either by hand or machinery;

3. The installation of all forms of plastic, slate, slag, gravel; asphalt and composition roofing; rock asphalt mastic when used for damp and waterproofing; prepared paper; compressed paper and chemically prepared paper, and burlap with or without coating. The installation of all damp resisting preparations regardless of the method of application in or outside of building. The installation of damp courses, sheeting, or coating on foundation work and tarred roofs. The laying of the tile or brick, when laid in asphalt or pitch tar;

4. The installation and application of new materials used in roofing, water-proofing, encapsulation, and containment process including all forms of elastomeric or plastic (elastoplastic), or both, roofing systems, both sheet and liquid applied, whether single-ply or multi-ply. The installation of aggregates or stone, used as a ballast for inverted roofing membrane assembly, or roof of similar construction where insulation is laid over the roofing membrane. The sealing and caulking of seams and joints on these elastoplastic systems to insure water-tightness. The applying of liquid-type elastoplastic preparation for roofing, damp, or waterproofing when applied with a squeegee, trowel, roller, or spray equipment whether applied inside or outside of a building. The priming of surfaces to be roofed, damp, or waterproofed, whether done by roller, mop, swab, three- (3-) knot brush, or spray systems. The waterproofing of all types of preformed panels;

5. The application of all types of spray-in-place such as urethane or polyurethane, and the coatings that are



applied over them;

6. The application of roof insulation, when the insulation material is applied as an integral part of the roofing system, whether the insulation material is applied as the first, last, or any other layer in between;

7. The operation and servicing of all kettles, bulk tankers, stationary heating tankers, and other types of equipment and tools used to accomplish this work (including heating systems for the operation of the equipment); and compressors for applying roofing material components, roof and mop carts, hydraulics, tools and equipment, be it hand or power, needed to apply waterproofing, insulated, and roofing materials;

8. The handling, hoisting, and storing of all roofing, damp, and waterproofing materials; and

9. The tear-off, removal, or both, of any type of roofing, all spudding, sweeping, vacuuming, cleanup, or a combination of these, of any areas of any type where a roof is to be relayed;

(R) Sheet Metal Worker—The work falling within the occupational title of sheet metal worker includes:

1. The handling, conditioning, assembling, installing, servicing, repairing, altering, and dismantling of the duct work for the heating, ventilation, and air-conditioning systems regardless of the materials used and the setting of all equipment and all supports and reinforcements in connection with the system;

2. The installation of expansion and discharge valves, air filters, and water filters in heating, ventilation, and air-conditioning systems;

3. The testing and balancing of air-handling equipment and duct work;

4. The forming, rolling, drawing, stamping, or pressing of sheet metal shingles, sheet metal tile, sheet metal brick, sheet metal stone, and sheet metal lumber, when specified for use as roofing, siding, waterproofing, weather proofing, fire proofing, or for ornamental or any other purpose;

5. The performing of sheet metal work specified for use in connection with or incidental to steeples, domes, minarets, look outs, dormers, louvers, ridges, copings, roofing, decking, hips, valleys, gutters, outlets, roof flanges, flashings, gravel stops, leader heads, down spouts, mansards, balustrades, skylights, cornice moulding, columns, capitals, panels, pilasters, mullions, spandrils, and any and all other shapes, forms and design of sheet metal work specified for use for waterproofing, weatherproofing, fire proofing, ornamental, decorative, or display purposes, or as trim on exterior of the buildings;

6. The installing of sheet metal ceilings

with cornices and mouldings of plain, ornamental, enameled, glazed, or acoustic type;

7. The installing of side walls, wainscoting of plain, ornamental, enameled, or glazed types, including sheet metal tile;

8. The application of all necessary wood or metal furring, plastic, or other materials, to which they are directly applied;

9. The performing of sheet-metal work specified for use in connection with or incidental to direct, indirect, or other types of heating, ventilating, air-conditioning, and cooling systems (including risers, stacks, ducts, S strips, fittings, dampers, casings, recess boxes, outlets, radiator enclosures, exhausts, ventilators, frames, grisses, louvers, registers, cabinets, fans, and motors);

10. The air washers, filters, air brushes, housings, air-conditioning chambers;

11. The setting and hanging of air-conditioning units, unit heaters or air-veyor systems, and air handling systems regardless of material used;

12. The assembling and setting up of all cast iron parts, warm air furnace, all stoker, gas, and oil burner equipment used in connection with warm air heating, all sheet metal hoods, casings, wall stacks, smoke pipes, truck lines, cold air intake, air chambers, vent pipes, frames, registers, dampers, and regulation devices;

13. The installing of equipment utilized in the operation of kitchens including ranges, canopies, steam tables, work tables, dish-washers, coffee urns, soda fountains, warming closets, sinks, drainboards, garbage chutes, incinerators, and refrigerators;

14. The installing of tubing, pipes, and fittings, used in connection with or incidental to coppersmithing work. The installation of fume hoods, metal toilet partitions, metal lockers, plain metal shelving; and

15. The handling, moving, hoisting, and storing of all sheet metal materials on the job site, where power equipment and rigging are required;

(S) Sprinkler Fitter—Applies to workers who perform the installation, adjustments, and corrections, repair, and dismantling of all fire protection and fire control systems and the installation of all fire piping for tubing, appurtenances, and equipment. The work falling within the occupational title includes: The handling and installation of all piping and appurtenances pertaining to sprinkler equipment, including both overhead and underground water mains, fire hydrants and hydrant mains, standpipes, and hose connections to the sprinkler systems, sprinkler tank heaters, air lines and thermal systems used in connection with sprinkler and alarm systems, tank and pump connections, and fire protection systems using mulsifyre, spray, water,

fog, carbon dioxide (CO<sub>2</sub>), gas and foam and dry chemical systems; and

(T) Truck Driver (which shall include truck control service driver, truck driver group I, truck driver group II, truck driver group III, and truck driver group IV)—The workers who perform work falling within the occupational title of work description for truck driver includes the operation, repair, and servicing of the following mechanical equipment. This occupational title encompasses several subclassifications, with the title and work description considered in light of whether the public works project pertains to building construction or heavy/highway construction.

1. Building construction. The subtitles falling within the occupational title of work description for truck driver, as applicable to building construction, are as follows:

A. Truck control service driver - Applies to workers who perform work including:

(I) The delivery, installation, and pickup of traffic control devices;

(II) The unloading and installation of barricades, plastic channelizer drums, safety cones, and temporary flashing lights not to exceed one hundred fifteen (115) volts;

(III) Regular periodic inspections to assure that traffic control devices are clean, clearly visible, and properly positioned. Inspection and maintenance includes replacing batteries and bulbs in lights, cleaning reflective material and lenses, and repairing or replacing damaged or missing devices when incidental to and part of a public works construction project; and

(IV) Removal of all traffic control devices by loading them on a truck and driving them to a storage yard where they are unloaded;

B. Group I—This subtitle applies to workers who operate, monitor, control, repair, modify, assemble, erect, oil, and service the following equipment: flat bed trucks single axle, station wagons, pick-up trucks, material trucks single axle, tank wagon single axle;

C. Group II—This subtitle applies to workers who operate, monitor, control, repair, modify, assemble, erect, oil, and service the following equipment: agitator and transit mix-trucks;

D. Group III—This subtitle applies to workers who operate, monitor, control, repair, modify, assemble, erect, oil, and service the following equipment: flat bed trucks tandem axle, articulated dump trucks, material trucks tandem axle, tank wagon tandem axle; and

E. Group IV—This subtitle applies to workers who operate, monitor, control, repair, modify, assemble, erect, oil, and service the





following equipment: semi and/or pole trailers, winch, fork and steel trucks, distributor drivers and operators, tank wagon semi-trailer, Insley wagons, dumpsters, halftracks, speedace, euclids, and other similar equipment, A-frame and Derrick trucks, float or low boy, and boom truck.

2. Heavy/highway construction. The subtitles falling within the occupational title work description for truck driver, as applicable to heavy/highway construction, are as follows:

A. Truck control service driver – Applies to workers who perform work including:

(I) The delivery, installation, and pickup of traffic control devices;

(II) The unloading and installation of barricades, plastic channelizer drums, safety cones, and temporary flashing lights not to exceed one hundred fifteen (115) volts;

(III) Regular periodic inspections to assure that traffic control devices are clean, clearly visible, and properly positioned. Inspection and maintenance includes replacing batteries and bulbs in lights, cleaning reflective material and lenses, and repairing or replacing damaged or missing devices when incidental to and part of a public works construction project; and

(IV) Removal of all traffic control devices by loading them on a truck and driving them to a storage yard where they are unloaded;

B. Group I—This subtitle applies to workers who operate, monitor, control, repair, modify, assemble, erect, oil, and service the following equipment: flat bed trucks single axle, station wagons, pick-up trucks, material trucks single axle, tank wagon single axle;

C. Group II—This subtitle applies to workers who operate, monitor, control, repair, modify, assemble, erect, oil, and service the following equipment: agitator and transit mix-trucks;

D. Group III—This subtitle applies to workers who operate, monitor, control, repair, modify, assemble, erect, oil, and service the following equipment: flat bed trucks tandem axle, articulated dump trucks, material trucks tandem axle, tank wagon tandem axle; and

E. Group IV—This subtitle applies to workers who operate, monitor, control, repair, modify, assemble, erect, oil, and service the following equipment: semi-and/or pole trailers, winch, fork and steel trucks, distributor drivers and operators, tank wagon semi-trailer, Insley wagons, dumpsters, halftracks, speedace, euclids, and other similar equipment, A-frame and Derrick trucks, float or low boy, and boom truck.

*AUTHORITY: section 290.240.2., RSMo Supp. 2018.\* Original rule filed Sept. 15, 1992, effective May 6, 1993. Emergency amendment filed April 30, 1993, effective May 10, 1993, expired Aug. 28, 1993. Amended: Filed Aug. 13, 1996, effective Feb. 28, 1997. Amended: Filed Jan. 22, 1997, effective Sept. 30, 1997. Amended: Filed June 17, 2004, effective Dec. 30, 2004. Amended: Filed Aug. 19, 2010, effective Feb. 28, 2011. Amended: Filed Aug. 9, 2012, effective Feb. 28, 2013. Emergency amendment filed Nov. 7, 2014, effective Nov. 17, 2014, expired May 15, 2015. Amended: Filed Nov. 7, 2014, effective April 30, 2015. Emergency amendment filed Nov. 21, 2018, effective Dec. 1, 2018, expired May 29, 2019. Amended: Filed Nov. 21, 2018, effective July 30, 2019.*

*\*Original authority: 290.240, RSMo 1957, amended 1969, 2018.*

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**290.010. What constitutes a day's labor.** — From and after the first day of May, in the year eighteen hundred and sixty-seven, the period of eight hours shall be and constitute a legal day's work; but nothing in this section shall be so construed as to prevent parties to any contract for work, services or labor from agreeing upon a longer or shorter time. This section shall not apply to persons hired or employed by the month, nor to laborers or farm hands in the service of farmers or others engaged in agriculture.

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(RSMo 1939 § 10166)

Prior revisions: 1929 § 13205; 1919 § 6766; 1909 § 7812

CROSS REFERENCE:

Election, employees allowed three hours to vote, 115.639

8/28/1939

**290.020. Limitation of working hours in certain industries, exception by consent of worker.** — It is hereby declared to be unlawful for any person, company or corporation engaged in carrying on any kind of mining, mechanical, chemical manufacturing or smelting business, to work their employees in any mill or mills, or plants, while engaged in crushing rocks and mine products, containing mineral or ores, or engaged in separating the minerals or ores from rock and such combination with which the mineral or ores are mixed, or reducing or roasting, or refining or smelting minerals or ores, from and after the time such rocks, or combination of rocks and mine products, or minerals or ores are taken out of the mines, at such labor or industry, for a period of time longer than eight hours in a day of twenty-four hours, without their consent, and it is hereby declared that eight hours shall constitute a day of employment, for all laborers, or employees, engaged in the kind of labor or industry aforesaid.

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(RSMo 1939 § 10167, A.L. 1981 H.B. 748)

Prior revisions: 1929 § 13206; 1919 § 6767; 1909 § 7813

8/28/1981

**290.030. Penalty.** — Any person or persons, company or corporation who shall violate any of the provisions of section 290.020 shall, on conviction, be fined in a sum not less than twenty-five dollars nor more than five hundred dollars.

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(RSMo 1939 § 10168)

Prior revisions: 1929 § 13207; 1919 § 6768; 1909 § 7814

8/28/1939



**290.080. Employees paid semimonthly, exception — statement of deductions — violation, misdemeanor.** — All corporations doing business in this state, and all persons operating railroads or railroad shops in this state, shall pay the wages and salaries of their employees as often as semimonthly, within sixteen days of the close of each payroll period; provided, however, that executive, administrative and professional employees, and sales people and other employees compensated in whole or in part on a commission basis, at the option of such employers, may be paid their salaries or commissions monthly. Such corporations and persons either as a part of the check, draft or other voucher paying the wages or separately, shall furnish the employee at least once a month a statement showing the total amount of deductions for the period. Any corporation or person violating this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than fifty dollars, nor more than five hundred dollars, for each offense.

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(RSMo 1939 §§ 5080, 5081, 10176, A. 1949 S.B. 1105, A.L. 1955 p. 596)

Prior revisions: 1929 §§ 4608, 4609, 13215; 1919 §§ 9802, 9803, 6778; 1909 § 7820

CROSS REFERENCE:

Wages, when to be paid, interest, priority, 430.360

8/28/1955

**290.090. Factory employees paid semimonthly — amount withheld — penalty.** — The employees of the operators of all manufactories, including plate glass manufactories, operated within this state shall be regularly paid in full of all wages due them at least once in every fifteen days, in lawful money, and at no pay day shall there be withheld from the earnings of any employee any sum to exceed the amount due him for his labor for five days next preceding any such pay day. Any such operator who fails and refuses to pay his employees, their agents, assigns or anyone duly authorized to collect such wages, as in this section provided, shall become immediately liable to any such employee, his agents or assigns for an amount double

the sum due such employee at the time of such failure to pay the wages due, to be recovered by civil action in any court of competent jurisdiction within this state, and no employee, within the meaning of this section, shall be deemed to have waived any right accruing to him under this section by any contract he may make contrary to the provisions hereof.

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(RSMo 1939 § 10175)

Prior revisions: 1929 § 13214; 1919 § 6775; 1909 § 7817

8/28/1939

**290.095. Wage subsidies, bid supplements, and rebates for employment prohibited, when — violation, penalty. —** 1. No contractor or subcontractor may directly or indirectly receive a wage subsidy, bid supplement, or rebate for employment on a public works project if such wage subsidy, bid supplement, or rebate has the effect of reducing the wage rate paid by the employer on a given occupational title below the wage rate required to be paid for such project pursuant to sections [290.210 to 290.340](#).

2. In the event a wage subsidy, bid supplement, or rebate is lawfully provided or received under subsection 1 of this section, the entity receiving such subsidy, supplement, or rebate shall report the date and amount of such subsidy, supplement, or rebate to the public body within thirty days of receipt of payment. This disclosure report shall be a matter of public record under [chapter 610](#).

3. Any employer in violation of this section shall owe to the public body double the dollar amount per hour that the wage subsidy, bid supplement, or rebate has reduced the wage rate paid by the employer below the wage rate required to be paid for such project pursuant to sections [290.210 to 290.340](#) for each hour that work was performed. It shall be the duty of the department to calculate the dollar amount owed to the public body under this section.

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(L. 2007 S.B. 339, A.L. 2018 H.B. 1729, et al.)

8/28/2018



**290.100. Thirty days' notice of reduction of wages, how. —** Any railway, mining, express, telegraph, manufacturing or other company or corporation doing business in this state, and desiring to reduce the wages of its employees, or any of them, shall give to the employees to be affected thereby thirty days' notice thereof. Such notice may be given by posting a written or printed handbill, specifying the class of employees whose

wages are to be reduced and the amount of the reduction, in a conspicuous place in or about the shops, station, office, depot or other place where said employees may be at work, or by mailing each employee a copy of said notice or handbill, and such company or corporation violating any of the provisions of this section shall forfeit and pay each party affected thereby the sum of fifty dollars, to be recovered by civil action in the name of the injured party, with costs, before any court of competent jurisdiction.

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(RSMo 1939 §§ 5066, 5067, A.L. 1943 p. 410 § 75)

Prior revisions: 1929 §§ 4590, 4591; 1919 §§ 9782, 9783; 1909 §§ 3022, 3023

8/28/1943

**290.110. Payment due discharged employee — exceptions — penalty for delay. —** Whenever any person, firm or corporation doing business in this state shall discharge, with or without cause, or refuse to further employ any servant or employee thereof, the unpaid wages of the servant or employee then earned at the contract rate, without abatement or deduction, shall be and become due and payable on the day of the discharge or refusal to longer employ and the servant or employee may request in writing of his foreman or the keeper of his time to have the money due him, or a valid check therefor, sent to any station or office where a regular agent is kept; and if the money or a valid check therefor, does not reach the station or office within seven days from the date it is so requested, then as a penalty for such nonpayment the wages of the servant or employee shall continue from the date of the discharge or refusal to further employ, at the same rate until paid; provided, such wages shall not continue more than sixty days. This section shall not apply in the case of an employee whose remuneration for work is based primarily on commissions and whose duties include collection of accounts, care of a stock or merchandise and similar activities and where an audit is necessary or customary in order to determine the net amount due.

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(RSMo 1939 § 5082, A.L. 1943 p. 410 § 76, A.L. 1963 p. 414, A.L. 1972 H.B. 1203)

Prior revisions: 1929 § 4610; 1919 § 9804

8/28/1972

**290.120. Employee not entitled to benefits, when. —** No such servant or employee who secretes or absents himself to avoid payment to him, or refuses to receive the same when fully tendered, shall be entitled to any benefit under sections [290.110](#) and [290.120](#) for such time as he so avoids payment.

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(RSMo 1939 § 5083, A.L. 1943 p. 410 § 77)

Prior revisions: 1929 § 4611; 1919 § 9805

8/28/1943



**290.130. Action by employees for breach of employment contract.** — Any such servant or employee whose employment is for a definite period of time, and who is discharged without cause before the expiration of such time, may, in addition to the penalty prescribed by this law, have an action against any such employer for any damages he may have sustained by reason of such wrongful discharge, and such action may be joined with an action for unpaid wages and penalty.

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(RSMo 1939 § 5084, A.L. 1943 p. 410 § 78)

Prior revisions: 1929 § 4612; 1919 § 9806

8/28/1943

**290.140. Letter of dismissal, when — failure to issue, damages — punitive damages, limitations.** — 1. Whenever any employee of any corporation doing business in this state and which employs seven or more employees, who shall have been in the service of said corporation for a period of at least ninety days, shall be discharged or voluntarily quit the service of such corporation and who thereafter within a reasonable period of time, but not later than one year following the date the employee was discharged or voluntarily quit, requests in writing by certified mail to the superintendent, manager or registered agent of said corporation, with specific reference to the statute, it shall be the duty of the superintendent or manager of said corporation to issue to such employee, within forty-five days after the receipt of such request, a letter, duly signed by such superintendent or manager, setting forth the nature and character of service rendered by such employee to such corporation and the duration thereof, and truly stating for what cause, if any, such employee was discharged or voluntarily quit such service.

2. Any corporation which violates the provisions of subsection 1 of this section shall be liable for compensatory but not punitive damages but in the event that the evidence establishes that the employer did not issue the requested letter, said employer may be liable for nominal and punitive damages; but no award of punitive damages under this section shall be based upon the content of any such letter.

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(RSMo 1939 § 5064, A.L. 1941 p. 330, A.L. 1982 S.B. 747)

Prior revisions: 1929 § 4588; 1919 § 9780; 1909 § 3020

CROSS REFERENCE:

## Employee dismissal rights, damage action, time limitation, 516.140

(1985) Actual damages in a "service letter" case are proven by showing that the plaintiff was refused employment or hindered in obtaining employment, due to the absence or inadequacy of a service letter, that the position plaintiff was refused or hindered in obtaining was actually open, and the rate of pay of that position. *Gibson v. Hummel* (Mo. App. E.D.), 688 S.W.2d 4.

(1985) An award of punitive damages based on the failure to provide a service letter is improper except upon a showing of actual or legal malice. *Comerio v. Beatrice Foods Co.*, 616 F.Supp. 1423 (D.C.Mo.).

(1986) An employer which fails to issue the service letter within forty-five days of it being requested may be liable for punitive damages. *Talbert v. Safeway Stores, Inc.* 651 F.Supp. 1563 (W.D. Mo.).

1986) A statement that termination is due to "unsatisfactory work performance" is insufficient as a matter of law under this section. *Gloria v. University of Health Sciences*, 713 S.W.2d 32 (Mo. App. W.D.).

(1987) Legal malice must be proven in order to recover punitive damages pursuant to this section and such malice must be averred generally in the petition. *Willett v. Slay Warehouse Co., Inc.*, 735 S.W.2d 60 (Mo. App. E.D.).

(1987) Legal malice or the deliberate failure to provide a service letter knowing that an individual has requested one perhaps may be shown in order to recover punitive damages by proving that this section was cited in the request for a service letter. *Fink v. Revco Discount Drug Centers, Inc.*, 666 F.Supp. 1325 (W.D. Mo.).

(1990) Letter requesting statement of reasons for employee's discharge signed only by the employee's attorney and not by the employee is not a valid request for a service letter. *Zeman v. V.F. Factory Outlet, Inc.*, 911 F.2d 107 (8th Cir.).

(1990) Discharged employee not entitled to actual damages for an employer's violation of service letter statute for false statements unless employee can show evidence that prospective employer saw letter and held it against employee. Employee could seek nominal damages. *Prewitt v. Factory Motor Parts, Inc.*, 747 F.Supp. 560 (W.D. Mo.).

8/28/1982

**290.145. Discrimination, refusal to hire or discharge employee for alcohol or tobacco use not during working hours, prohibited, exception — not cause for legal actions.** — It shall be an improper employment practice for an employer to refuse to hire, or to discharge, any individual, or to otherwise disadvantage any individual, with respect to compensation, terms or conditions of employment because the individual

uses lawful alcohol or tobacco products off the premises of the employer during hours such individual is not working for the employer, unless such use interferes with the duties and performance of the employee, the employee's coworkers, or the overall operation of the employer's business; except that, nothing in this section shall prohibit an employer from providing or contracting for health insurance benefits at a reduced premium rate or at a reduced deductible level for employees who do not smoke or use tobacco products. Religious organizations and church-operated institutions, and not-for-profit organizations whose principal business is health care promotion shall be exempt from the provisions of this section. The provisions of this section shall not be deemed to create a cause of action for injunctive relief, damages or other relief.

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(L. 1992 S.B. 509, et al. § 6, A.L. 2005 H.B. 596, A.L. 2006 S.B. 567 & 792)

8/28/2006



**290.152. Employer response to request for information about current or former employee, contents, requirements, civil immunity, when.** — 1. As used in this section, the following terms shall mean:

(1) "**Employer**", any individual, organization, partnership, political subdivision, corporation or other legal entity which has or had in the entity's employ one or more individuals performing services for the entity within this state;

(2) "**Prospective employer**", any employer, as defined in this subsection, to which an individual has made application for employment, either oral or written, or forwarded a resume or other correspondence expressing an interest in employment.

2. An employer may:

(1) Respond in writing to a written request concerning a current or former employee from an entity or person which the employer reasonably believes to be a prospective employer of such employee; and

(2) Disclose the nature and character of service rendered by such employee to such employer and the duration thereof; and

(3) Truly state for what cause, if any, such employee was discharged or voluntarily quit such service. The provisions of this section shall apply regardless of whether the employee becomes employed by the prospective employer prior to receipt of the former employer's written response. The information provided pursuant to this section shall be consistent with the content of any service letter provided pursuant to section [290.140](#) for the same employee.



3. The employer shall send a copy of any letter provided pursuant to subsection 2 of this section to the current employee or former employee at the employee's last known address. The current or former employee may request from the employer a copy of the letter provided pursuant to subsection 2 of this section for up to one year following the date of such letter.

4. For purposes of this section, an employer shall be immune from civil liability for any response made pursuant to this section or for any consequences of such response, unless such response was false and made with knowledge that it was false or with reckless disregard for whether such response was true or false.

5. Any employer who violates the provisions of subsection 2 of this section shall be liable for compensatory damages but not punitive damages.

6. Any letter issued pursuant to this section shall not be admitted as evidence in an unemployment compensation claim.

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(L. 1999 S.B. 32)

8/28/1999

**290.210. Definitions.** — As used in sections 290.210 to 290.340, unless the context indicates otherwise, the following terms shall mean:

(1) "**Collective bargaining agreement**", any written agreement or understanding between an employer or employer association and a labor organization or union which is the exclusive bargaining representative of the employer's or employer association's employees pursuant to the terms of the National Labor Relations Act and which agreement or understanding or predecessor agreement or understanding has been used to determine an occupational title wage rate;

(2) "**Construction**", construction, reconstruction, improvement, enlargement, alteration, painting and decorating, or major repair;

(3) "**Department**", the department of labor and industrial relations;

(4) "**Labor organization**" or "**union**", any entity which has been designated pursuant to the terms of the National Labor Relations Act as the exclusive bargaining representative of employees of employers engaged in the construction industry, which entity or affiliated entity has ever had a collective bargaining agreement which determined an occupational title wage rate;

(5) "**Locality**", the county where the physical work upon public works is performed;

(6) "**Maintenance work**", the repair, but not the replacement, of existing facilities when the size, type or extent of the existing facilities is not thereby changed or increased;

(7) "**Prevailing hourly rate of wages**" or "**prevailing wage rate**", the wages paid generally, to workers engaged in work of a similar character in the locality in which the public works is being performed, including the basic hourly rate of pay and the amount of the rate of contributions irrevocably made to a fund, plan or program, and the amount of the rate of costs to the contractor or subcontractor which may be reasonably anticipated in providing benefits to workers and mechanics pursuant to an enforceable commitment to carry out a financially responsible plan or program which was communicated in writing to the workmen affected, for medical or hospital care, pensions on retirement or death, compensation for injuries or illness resulting from occupational activity, or insurance to provide any of the foregoing, for unemployment benefits, life insurance, disability and sickness insurance, accident insurance, for vacation and holiday pay, for defraying costs of apprenticeship or other similar programs, or for other bona fide fringe benefits, but only where the contractor or subcontractor is not required by other federal or state law to provide any of the benefits; provided, that the obligation of a contractor or subcontractor to make payment in accordance with the prevailing wage determinations of the department, insofar as sections [290.210](#) to [290.340](#) are concerned, may be discharged by the making of payments in cash, by the making of irrevocable contributions by the assumption of an enforceable commitment to bear the costs of a plan or program as provided herein, or any combination thereof, where the aggregate of such payments, contributions and costs is not less than the rate of pay plus the other amounts as provided herein;

(8) "**Public body**", the state of Missouri or any officer, official, authority, board or commission of the state, or other political subdivision thereof, or any institution supported in whole or in part by public funds;

(9) "**Public works**", all fixed works constructed for public use or benefit or paid for wholly or in part out of public funds. It also includes any work done directly by any public utility company when performed by it pursuant to the order of the public service commission or other public authority whether or not it be done under public supervision or direction or paid for wholly or in part out of public funds when let to contract by said utility. It does not include any work done for or by any drainage or levee district;

(10) "**Public works contracting minimum wage**", the wage rate determined by the department pursuant to section [290.257](#);

(11) "**Workers**", laborers and mechanics.

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 (L. 1957 p. 574 § 1, A.L. 1965 p. 438, A.L. 1969 S.B. 142, A.L. 2013 H.B. 34, A.L. 2018 H.B. 1729, et al.)

(1981) Industrial development projects are not subject to the Prevailing Wage Act unless the projects constitute "public works" and involve workmen employed by or on behalf of a public body engaged in public works. *State ex rel. Ashcroft v. City of Sedalia* (Mo. App. W.D.), 629 S.W.2d 578.

8/28/2018

**290.220. Policy declared.** — It is hereby declared to be the policy of the state of Missouri that a wage of no less than 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 public works, exclusive of maintenance work.

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 (L. 1957 p. 574 § 2, A.L. 2018 H.B. 1729, et al.)

8/28/2018



**290.230. Prevailing wage rates required on construction of public works — who is deemed employed upon public works — inapplicability of prevailing wage, when.**  
 — 1. (1) Except as otherwise provided in this section, not less than 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.

(2) For all work performed on a Sunday or a holiday, not less than twice 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 purposes of this subdivision, "**holiday**" shall include each of the following:

- (a) January first;
- (b) The last Monday in May;
- (c) July fourth;

- (d) The first Monday in September;
- (e) November eleventh;
- (f) The fourth Thursday in November; and
- (g) December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

(3) For all overtime work performed, not less than one and one-half 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

(4) 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.

2. Only workers that are directly employed by contractors or subcontractors in actual construction work on the site of the building or construction job shall be deemed to be employed upon public works.

3. Any worker who agrees in writing to volunteer his or her labor without pay shall not be deemed to be employed upon public works, and shall not be entitled to the wage rates required pursuant to sections [290.210](#) to [290.340](#). For the purposes of this section, the term "**worker who agrees in writing to volunteer his or her labor without pay**" shall mean a worker who volunteers his or her labor without any promise of benefit or remuneration for such voluntary activity, and who is not a prisoner in any jail or prison facility and who is not performing community service pursuant to disposition of a criminal case against him or her, and is not otherwise employed for compensation at any time in the construction or maintenance work on the same public works for which the worker is a volunteer. Under no circumstances may an employer or a public body force, compel or otherwise intimidate a worker into performing work otherwise paid at a prevailing wage rate or at a public works contracting minimum wage rate as a volunteer.

4. When the hauling of materials or equipment includes some phase of construction other than the mere transportation to the site of the construction, workers engaged in

this dual capacity shall be deemed employed directly on public works.

5. (1) The provisions of sections 290.210 to 290.340 shall not apply to the construction of public works for which either the engineer's estimate or the bid accepted by the public body for the total project cost is in the amount of seventy-five thousand dollars or less.

(2) The total project cost shall be based upon the entire project and not individual projects within a larger project.

(3) The total project cost shall include the value of work performed on the project by every person paid by a contractor or subcontractor for that person's work on the project. The total project cost shall additionally include all materials and supplies purchased for the project.

6. A public body shall not divide a project into multiple contracts for the purpose of lowering the total project cost below the threshold described in subsection 5 of this section.

7. For any public works project for which either the engineer's estimate or the bid accepted by the public body for the total project cost is in the amount of seventy-five thousand dollars or less that becomes subject to a change order that increases the total project cost in excess of seventy-five thousand dollars, the provisions of sections 290.210 to 290.340 shall apply only to that portion of the project that was in excess of seventy-five thousand dollars.

8. Notwithstanding any provision of law to the contrary, for the purposes of construction of public works for which either the engineer's estimate or the bid accepted by the public body for the total project cost is in the amount of ten thousand dollars or less for all occupational titles, public bodies shall be exempt from any law requiring the use of competitive bids.

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(L. 1957 p. 574 § 3, A.L. 2014 H.B. 1594, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.235. On-the-job training periods, use of entry-level workers and apprentices — wages — aggregate limit.** — 1. Employers may use entry-level workers and federally registered apprentices for on-the-job training periods. The wage rate for on-the-job training workers shall be equal to fifty percent of the applicable wage rate for a journeyman worker under the appropriate occupational title for a specific locality.

2. The combined total of entry-level workers and federally registered apprentices shall not exceed a one-to-one ratio with the number of journeyman workers in any

occupational title on a public works project subject to sections [290.210 to 290.340](#).

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(L. 2018 H.B. 1729, et al.)

8/28/2018

**290.240. Department inquiry into complaints — rulemaking authority.** — 1. The department shall inquire diligently into complaints regarding any violation of sections [290.210 to 290.340](#), shall institute actions for penalties herein prescribed, and shall enforce generally the provisions of sections [290.210 to 290.340](#). Complaints regarding any violation of sections [290.210 to 290.340](#) shall be filed with the department. The following interested parties are the only parties allowed to file such complaints with the department:

(1) Any decision-making public servant for a public body for which a public works project is being performed, if the complaint is against the contractor or subcontractor for the project;

(2) Any contractor, if the complaint is against his or her subcontractor for work performed on behalf of a public body;

(3) Any subcontractor, if the complaint is against his or her contractor for work performed on behalf of a public body; and

(4) Any worker who alleges a violation of his or her rights under sections [290.210 to 290.340](#).

2. The department may establish rules and regulations for the purpose of carrying out the provisions of sections [290.210 to 290.340](#).

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(L. 1957 p. 574 § 6, A.L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018



**290.250. Applicable wage rates, incorporation into contracts — failure to pay, penalty — complaints of violation, public body or prime contractor to withhold payment — determination of a violation, investigation required — employer's right to dispute — enforcement proceeding permitted, when.** — 1. Every public body authorized to contract for or construct public works before advertising for bids or undertaking such construction shall request the department to determine the applicable wage rates in the locality where the work is to be performed. The department shall determine the applicable wage rates in the locality in which the work is to be performed as provided in section [290.257](#). Such determination or schedule of the wage rates shall be attached to and made a part of the specifications for the

work. The public body shall then specify in the resolution or ordinance and in the call for bids for the contract the wage rates in the locality needed to execute the contract. The contractor to whom the contract is awarded and any subcontractor under the contractor shall pay not less than the specified wage rates to all workers employed by them in the execution of the contract. The public body awarding the contract shall cause to be inserted in the contract a stipulation to the effect that not less than the specified wage rates shall be paid to all workers performing work under the contract. The contractor shall forfeit as a penalty to the public body on whose behalf the contract is made or awarded one hundred dollars for each worker employed, for each calendar day, or portion thereof, such worker is paid less than the specified wage rates for any work done under the contract, by the contractor or by any subcontractor under the contractor, and the public body awarding the contract shall cause to be inserted in the contract a stipulation to this effect. The public body awarding the contract, and its agents and officers, shall take cognizance of all complaints of all violations of the provisions of sections [290.210 to 290.340](#) committed in the course of the execution of the contract, and, when making payments to the contractor becoming due under the contract, shall withhold and retain therefrom all sums and amounts due and owing as a result of any violation of sections [290.210 to 290.340](#). Any contractor may withhold from any subcontractor sufficient sums to cover any penalties withheld by the awarding public body on account of the subcontractor's failure to comply with the terms of sections [290.210 to 290.340](#), and if payment has already been made, the contractor may recover from the subcontractor the amount of the penalty in a suit at law.

2. In determining whether a violation of sections [290.210 to 290.340](#) has occurred, and whether a penalty shall be imposed pursuant to subsection 1 of this section, the department shall investigate any complaint made by an interested party listed under section [290.240](#). Upon completing such investigation, the department shall notify the employer of its findings. If the department concludes that a violation of sections [290.210 to 290.340](#) has occurred and a penalty may be due, the department shall notify the employer of such finding by providing a notice of penalty to the employer. Such penalty shall not be due until forty-five days after the date of the notice of the penalty.

3. The employer shall have the right to dispute such notice of penalty in writing to the department within forty-five days of the date of the notice. Upon receipt of this written notice of dispute, the department shall notify the employer of the right to resolve such dispute through arbitration. The state and the employer shall submit to an arbitration process to be established by the department by rule, and in conformance with the guidelines and rules of the American Arbitration Association or other

arbitration process mutually agreed upon by the employer and the state. If at any time prior to the department pursuing an enforcement action to enforce the monetary penalty provisions of subsection 1 of this section against the employer, the employer pays the back wages as determined by either the department or the arbitrator, the department shall be precluded from initiating any enforcement action to impose the monetary penalty provisions of subsection 1 of this section.

4. If the employer fails to pay all wages due as determined by the arbitrator within forty-five days following the conclusion of the arbitration process, or if the employer fails to exercise the right to seek arbitration, the department may then pursue an enforcement action to enforce the monetary penalty provisions of subsection 1 of this section against the employer. If the court orders payment of the penalties as prescribed in subsection 1 of this section, the department shall be entitled to recover its actual cost of enforcement from such penalty amount.

5. Nothing in this section shall be interpreted as precluding an action for enforcement filed by an aggrieved employee as otherwise provided in law.

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(L. 1957 p. 574 § 4, A.L. 1969 S.B. 142, A.L. 2007 S.B. 339, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.257. Determination of prevailing wage — annual calculation — final determination, when — occupational titles, applicability. — 1. (1)** In determining the prevailing wage rate, the department shall accept and consider information submitted in either paper or electronic format regarding local wage rates for construction projects that occurred during the year preceding the annual wage order to be issued, provided that information regarding local wage rates for entry-level workers and federally registered apprentices shall not be considered.

(2) (a) The prevailing wage rate for each occupational title shall be equal to the weighted average wage for that occupational title.

(b) For purposes of this subdivision, the following terms shall mean:

a. "**Reported wage sum**", for each occupational title, the sum of every product of each reported wage rate, which shall include fringe benefits, multiplied by the total number of reportable hours at such wage rate; and

b. "**Weighted average wage**", the reported wage sum for each occupational title divided by the total number of reportable hours for that occupational title.

2. The department shall annually calculate the public works contracting minimum wage in each locality. The public works contracting minimum wage shall be equal to



one hundred twenty percent of the average hourly wage in a particular locality, as determined by the Missouri economic research and information center within the department of economic development, or any successor agency.

3. A final determination of the prevailing hourly rate of wages and the public works contracting minimum wage applicable to every locality to be contained in an annual wage order shall be made annually on or before July 1, 2019, and July first of each year thereafter. The wage order shall remain in effect until superseded by a new annual wage order. The department shall, by March 10, 2019, and March tenth of each year thereafter, make an initial determination of the prevailing wage rate for each occupational title within the locality as well as an initial determination as to the public works contracting minimum wage. Objections may be filed as to any initial determination as provided in section [290.262](#).

4. (1) If the total number of reportable hours that are paid pursuant to a collective bargaining agreement and the total number of reportable hours that are not paid pursuant to a collective bargaining agreement equal or exceed, in the aggregate, one thousand hours for any particular occupational title within a locality, workers engaged in that occupational title in such locality shall be paid the prevailing wage rate determined by the department pursuant to this section.

(2) If the total number of reportable hours that are paid pursuant to a collective bargaining agreement and the total number of reportable hours that are not paid pursuant to a collective bargaining agreement do not equal or exceed, in the aggregate, one thousand hours for any particular occupational title within a locality, workers engaged in that occupational title in such locality shall be paid the public works contracting minimum wage.

5. For purposes of this section, the term "**reportable hours**" shall mean hours reported by a contractor for work performed under such contractor in a particular occupational title within a particular locality.

6. (1) The different types of occupational titles to which sections [290.210 to 290.340](#) shall apply shall be limited to, and shall include, all of the following:

(a) Asbestos worker;

(b) Boilermaker;

(c) Bricklayer;

(d) Carpenter, which shall include pile driver, millwright, lather, and linoleum layer;

- (e) Cement mason, which shall include plasterer;
- (f) Communications technician;
- (g) Electrician;
- (h) Elevator constructor;
- (i) Glazier;
- (j) Ironworker;
- (k) General laborer, including first semi-skilled laborer and second semi-skilled laborer;
- (l) Mason, which shall include marble mason, marble finisher, terrazzo worker, terrazzo finisher, tile setter, and tile finisher;
- (m) Operating engineer, which shall include operating engineer group one, operating engineer group two, operating engineer group three, operating engineer group three-A, operating engineer group four, and operating engineer group five;
- (n) Outside lineman, lineman operator, groundman, lineman tree trimmer, groundman tree trimmer, and any combination thereof;
- (o) Painter;
- (p) Plumber, which shall include pipefitter;
- (q) Roofer;
- (r) Sheet metal worker;
- (s) Sprinkler fitter; and
- (t) Truck driver, which shall include truck control service driver, truck driver group one, truck driver group two, truck driver group three, and truck driver group four.

(2) Each occupational title listed in subdivision (1) of this subsection shall have the same meaning and description as given to such occupational title in 8 CSR 30-3.060.

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(L. 2018 H.B. 1729, et al.)

8/28/2018

**290.260. Determination of hourly rate for heavy and highway construction work, when made, where filed, objections, hearing, determination.** — 1. The department, as it deems necessary, shall from time to time investigate and determine the prevailing hourly rate of wages for heavy and highway construction work in the localities. In doing so, the department shall accept and consider information regarding local wage

rates that is submitted in either paper or electronic formats. A determination applicable to every locality to be contained in a general wage order shall be made annually on or before July first of each year for the Missouri state highways and transportation commission and shall remain in effect until superseded by a new general wage order. In determining prevailing rates, the department shall ascertain and consider the applicable wage rates established by collective bargaining agreements, if any, and the rates that are paid generally within the locality.

2. A certified copy of the determination so made shall be filed immediately with the secretary of state and with the department in Jefferson City. Copies shall be supplied by the department to all persons requesting them within ten days after the filing.

3. At any time within thirty days after the certified copies of the determinations have been filed with the secretary of state and the department, any person who is affected thereby may object in writing to the determination or the part thereof that he deems objectionable by filing a written notice with the department, stating the specific grounds of the objection.

4. Within thirty days of the receipt of the objection, the department shall set a date for a hearing on the objection. The date for the hearing shall be within sixty days of the receipt of the objection. Written notice of the time and place of the hearing shall be given to the objectors at least ten days prior to the date set for the hearing.

5. The department at its discretion may hear each written objection separately or consolidate for hearing any two or more written objections. At the hearing the department shall first introduce in evidence the investigation it instituted and the other facts which were considered at the time of the original determination which formed the basis for its determination. The department, or the objector, or any interested party, thereafter may introduce any evidence that is material to the issues.

6. Within twenty days of the conclusion of the hearing, the department must rule on the written objection and make the final determination that it believes the evidence warrants. Immediately, the department shall file a certified copy of its final determination with the secretary of state and with the department and shall serve a copy of the final determination on all parties to the proceedings by personal service or by registered mail.

7. This final decision of the department of the prevailing wages in the locality is subject to review in accordance with the provisions of [chapter 536](#). Any person affected, whether or not the person participated in the proceedings resulting in the final determination, may have the decision of the department reviewed. The filing of

the final determination with the secretary of state shall be considered a service of the final determination on persons not participating in the administrative proceedings resulting in the final determination.

8. At any time before trial any person affected by the final determination of the department may intervene in the proceedings to review under [chapter 536](#) and be made a party to the proceedings.

9. All proceedings in any court affecting a determination of the department under the provisions of sections [290.210 to 290.340](#) shall have priority in hearing and determination over all other civil proceedings pending in the court, except election contests.

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(L. 1957 p. 574 § 8, A.L. 1965 p. 95, A.L. 1969 S.B. 142, A.L. 2013 H.B. 34)

(1962) The function of the court in reviewing decision of industrial commission fixing hourly wage rate is to decide if the determination was authorized by law and supported by competent and substantial evidence upon the whole record. *United Bro. of Carpenters, etc. v. Industrial Commission (A.)*, 363 S.W.2d 82.

8/28/2013



**290.262. Determination of hourly rate, certification — objections, hearings — final determination — notice to department by public body, when. —** 1. A certified copy of any initial wage determinations made pursuant to section [290.257](#) shall be filed immediately with the secretary of state and with the department in Jefferson City. Copies shall be supplied by the department to all persons requesting them within ten days after the filing.

2. At any time within thirty days after the certified copies of the determinations have been filed with the secretary of state and the department, any person who is affected thereby may object in writing to a determination or a part thereof that he or she deems objectionable by filing a written notice with the department, stating the specific grounds of the objection. If no objection is filed, the determination is final after thirty days.

3. After the receipt of the objection, the department shall set a date for a hearing on the objection. The date for the hearing shall be within sixty days of the receipt of the objection. Written notice of the time and place of the hearing shall be given to the objectors at least ten days prior to the date set for the hearing.

4. The department at its discretion may hear each written objection separately or consolidate for hearing any two or more written objections. At the hearing the department shall first introduce in evidence the investigation it instituted and the other facts which were considered at the time of the original determination which formed the basis for its determination. The department, or the objector, or any interested party, thereafter may introduce any evidence that is material to the issues.

5. Within twenty days of the conclusion of the hearing, the department shall rule on the written objection and make the final determination that it believes the evidence warrants. Immediately, the department shall file a certified copy of its final determination with the secretary of state and with the department and shall serve a copy of the final determination on all parties to the proceedings by personal service or by registered mail.

6. This final decision of the department of the prevailing wages in the locality for each occupational title is subject to review in accordance with the provisions of [chapter 536](#). Any person affected, whether or not the person participated in the proceedings resulting in the final determination, may have the decision of the department reviewed. The filing of the final determination with the secretary of state shall be considered a service of the final determination on persons not participating in the administrative proceedings resulting in the final determination.

7. At any time before trial any person affected by the final determination of the department may intervene in the proceedings to review under [chapter 536](#) and be made a party to the proceedings.

8. Any annual wage order made for a particular occupational title in a locality, that is based on the number of hours worked under a collective bargaining agreement, may be altered once each year, as provided in this subsection. The prevailing wage for each such occupational title may be adjusted on the anniversary date of any collective bargaining agreement which covers all persons in that particular occupational title in the locality in accordance with any annual incremental wage increases set in the collective bargaining agreement. If the prevailing wage for an occupational title is adjusted pursuant to this subsection, the employee's representative or employer in regard to such collective bargaining agreement shall notify the department of this adjustment, including the effective date of the adjustment. The adjusted prevailing wage shall be in effect until the next final annual wage order is issued pursuant to this section. The wage rates for any particular job, contracted and commenced within sixty days of the contract date, which were set as a result of the annual or revised wage order, shall remain in effect for the duration of that particular job.

9. In addition to all other reporting requirements of sections 290.210 to 290.340, each public body which is awarding a contract for a public works project shall, prior to beginning of any work on such public works project, notify the department, on a form prescribed by the department, of the scope of the work to be done, the various types of craftsmen who will be needed on the project, and the date work will commence on the project.

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(L. 1993 H.B. 638, A.L. 2013 H.B. 34, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.263. Wage rates to equal or exceed federal minimum wage.** — The wage rates required to be paid to workers upon public works pursuant to sections 290.210 to 290.340 shall not be less than the minimum wage specified under Section 6(a)(1) of the Fair Labor Standards Act of 1938, as amended.

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(L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.265. Wage rates posted, where.** — A clearly legible statement of all wage rates required to be paid to all workers employed in order to execute the contract and employed on the construction of the public works shall be kept posted in a prominent and easily accessible place at the site thereof by each contractor and subcontractor engaged in the public works projects under sections 290.210 to 290.340 and such notice shall remain posted during the full time that any such worker shall be employed on the public works.

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(L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018



**290.270. Declaration as to wages final — maximum wages and hours not limited.** — The finding of the department ascertaining and declaring the prevailing hourly rate of wages and the public works contracting minimum wage shall be final for the locality, unless reviewed under the provisions of sections 290.210 to 290.340. Nothing in sections 290.210 to 290.340, however, shall be construed to prohibit the payment to any worker employed on any public work of more than the prevailing hourly rate of wages or the public works contracting minimum wage. Nothing in sections 290.210 to 290.340 shall be construed to limit the hours of work which may be performed by any worker in any particular period of time.

(L. 1957 p. 574 § 7, A.L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.280. Administration of oaths — subpoenas — enforcement of subpoenas. —** The authorized representative of the department may administer oaths, take or cause to be taken the depositions of witnesses, and require by subpoena the attendance and testimony of witnesses and the production of all books, records, and other evidence relative to any matter under investigation or hearing. The subpoena shall be signed and issued by the department's authorized representative. In case of failure of any person to comply with any subpoena lawfully issued under this section, or on the refusal of any witness to produce evidence or to testify to any matter regarding which he may be lawfully interrogated, the authorized representative of the department may proceed to enforce obedience to the subpoenas in the manner provided by section [536.077](#) for administrative agencies. The authorized representative of the department shall have the power to certify to official acts.

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(L. 1957 p. 574 § 9, A.L. 1961 p. 438)

8/28/1961

**290.290. Contractor's payroll records, contents — affidavit of compliance required — signs on motor vehicles and equipment, requirements — temporary stationary sign, when — exception. —** 1. The contractor and each subcontractor engaged in any construction of public works shall keep full and accurate records clearly indicating the names, occupations and crafts of every worker employed by them in connection with the public work together with an accurate record of the number of hours worked by each worker and the actual wages paid therefor. The payroll records required to be so kept shall be open to inspection by any authorized representative of the contracting public body or of the department at any reasonable time and as often as may be necessary and such records shall not be destroyed or removed from the state for the period of one year following the completion of the public work in connection with which the records are made.

2. Each contractor and subcontractor shall file with the contracting public body upon completion of the public work and prior to final payment therefor an affidavit stating that he or she had fully complied with the provisions and requirements of sections [290.210](#) to [290.340](#), and no public body shall be authorized to make final payment until such affidavit is filed therewith in proper form and order.

3. Each contractor and subcontractor engaged in any construction of public works shall 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 such public works project during the time the contractor or subcontractor is engaged on such project. The sign shall be legible from a distance of twenty feet but the size of the lettering need not be larger than two 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 subsection, at the main entrance of the construction 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.

4. The provisions of subsection 3 of this section shall not apply to construction of public works for which the contract awarded is in the amount of two hundred fifty thousand dollars or less.

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(L. 1957 p. 574 § 5, A.L. 1969 S.B. 142, A.L. 1993 H.B. 416 & 417, A.L. 2018 H.B. 1729, et al.)

8/28/2018



**290.300. Actions for wages by worker authorized.** — Any worker employed by the contractor or by any subcontractor under the contractor who shall be paid for his or her services in a sum less than the stipulated rates for work done under the contract, shall have a right of action for double whatever difference there may be between the amount so paid and the rates provided by the contract together with a reasonable attorney's fee to be determined by the court, and an action brought to recover same shall be deemed to be a suit for wages, and any and all judgments entered therein shall have the same force and effect as other judgments for wages.

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(L. 1957 p. 574 § 10, A.L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.305. Rebates by workers prohibited, exception.** — No person, firm or corporation shall violate the wage provisions of any contract contemplated in sections [290.210 to 290.340](#) or suffer or require any employee to work for less than the rate of wages so fixed, or violate any of the provisions contained in sections [290.210 to 290.340](#). Where workers are employed and their rate of wages has been determined as provided in sections [290.210 to 290.340](#), no person, either on his or her behalf or for



any other person, shall request, demand or receive, either before or after such worker is engaged, that such worker pay back, return, donate, contribute, or give any part or all of said worker's wages, salary, or thing of value, to any person, upon the statement, representation, or understanding that failure to comply with such request or demand will prevent such worker from procuring or retaining employment, and no person shall, directly or indirectly, pay, request or authorize any other person to violate this section. This section shall not apply to any agent or representative of a duly constituted labor organization acting in the collection of dues or assessments of such organization.

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(L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.315. Deductions from wages, agreement to be written, approval of public body required.** — All contractors and subcontractors subject to sections [290.210 to 290.340](#) shall make full payment of the required wages in legal tender, without any deduction for food, sleeping accommodations, transportation, use of small tools, or any other thing of any kind or description. This section shall not apply where the employer and employee enter into an agreement in writing at the beginning of said term of employment covering deductions for food, sleeping accommodations, or other similar items, provided such agreement is submitted by the employer to the public body awarding the contract and the same is approved by such public body as fair and reasonable.

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(L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018



**290.320. Advertising for bids before wage rates are determined prohibited.** — No public body, officer, official, member, agent or representative authorized to contract for public works shall fail, before advertising for bids or contracting for such construction, to have the department determine the wage rates in the locality where the work is to be performed as provided in sections [290.210 to 290.340](#).

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(L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.325. Awarding contract or payment without wage rate determination prohibited.** — No public body, officer, official, member, agent or representative thereof authorized to contract for public works shall award a contract for the

construction of such improvement or disburse any funds on account of the construction of such public improvement, unless such public body has first had the department determine the rates of wages required to be paid in the locality where the work is to be performed and such determination has been made a part of the specifications and contract for such public works.

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(L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018

**290.330. Convicted violators of sections 290.210 to 290.340 listed, effect of.** — The department after investigation, upon complaint made by an interested party listed under section 290.240 or upon its own initiative, shall file with the secretary of state a list of the contractors and subcontractors who it finds have been prosecuted and convicted for violations of sections 290.210 to 290.340 and such contractor or subcontractor, or simulations thereof, shall be prohibited from contracting directly or indirectly with any public body for the construction of any public works or from performing any work on the same as a contractor or subcontractor for a period of one year from the date of the first conviction for such violation and for a period of three years from the date of each subsequent violation and conviction thereof. No public body shall award a contract for a public works to any contractor or subcontractor, or simulation thereof, during the time that its name appears on said list. The filing of the notice of conviction with the secretary of state shall be notice to all public bodies and their officers, officials, members, agents and representatives.

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(L. 1969 S.B. 142, A.L. 2018 H.B. 1729, et al.)

8/28/2018



**290.335. Notice of violation, failure to comply, attorney general shall sue, injunctive relief authorized.** — If it is found that a public body, contractor or subcontractor has not complied with any of the terms of sections 290.210 to 290.340, the department shall give notice of the precise violation in writing to such public body, contractor or subcontractor. Sufficient time may be allowed for compliance therewith as the department deems necessary. After the expiration of the time prescribed in said notice, the department may in writing inform the attorney general of the fact that such notice has been given and that the public body, contractor or subcontractor or the authorized representative or agent thereof to whom it was directed has not complied with such notice. Upon receipt thereof, the attorney general shall at the earliest possible time bring suit in the name of the state in the circuit court of the county in

which such public body is located or where any such contractor or subcontractor is engaged in any public works to enjoin the award of such contract for a public works, or any further work or payments thereunder if the contract has been awarded, until the requirements of such notice are fully complied with. The court may issue a temporary restraining order with due notice to the defendant in such action. The plaintiff shall in any such injunctive action post an adequate bond to be set by the circuit judge. Upon final hearing thereof, if the court is satisfied that the requirements of the notice by the department to the defendant were not unreasonable or arbitrary, it shall issue an order enjoining the awarding of such contract for a public works, or any further work or payments thereunder if the contract has been awarded, until the notice is fully complied with. Such injunction shall continue operative until the court is satisfied that the requirements of such notice have been complied with and the court shall have and exercise with respect to the enforcement of such injunctions all the power in it in other similar cases. Both the plaintiff and defendant in such action have the same rights of appeal as are provided by law in other injunction proceedings.

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(L. 1969 S.B. 142)

8/28/1969

**290.340. Penalty for violation.** — Any officer, official, member, agent or representative of any public body, contractor or subcontractor who willfully violates and omits to comply with any of the provisions and requirements of sections [290.210](#) to [290.340](#) shall be punished for each violation thereof by a fine not exceeding five hundred dollars, or by imprisonment not exceeding six months, or by both such fine and imprisonment. Each day such violation or omission continues shall constitute a separate offense as contemplated by this section.

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(L. 1969 S.B. 142)

8/28/1969

**290.350. Request for arbitration, when, how made — board to be appointed.** — Whenever a dispute exists concerning wages, hours of labor, or conditions of employment of members of a paid fire department of any county, city, town, fire district, or other governmental unit having a population in excess of twenty thousand or located in a county of the first class, and a request for arbitration is made by either party to the dispute, a firemen's arbitration board shall be appointed as provided in sections [290.350](#) to [290.380](#). Request for arbitration may be made by written petition signed by at least fifty-one percent of the employees of the fire department or by

resolution of the county commission, council, board, or other governing body having direction and control over the fire department.

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(L. 1963 p. 415 § 1)

(1968) As applied to constitutional charter cities, §§ 290.350 and 290.360 are unconstitutional and void as imposing duties upon a municipal officer. State ex rel. Burke v. Cervantes, 423 S.W.2d 791 (Mo.).

8/28/1963



**290.360. Board members — selected, how — officers.** — The board shall consist of five members, four of whom shall be appointed by the chief executive officer of the county, city, town, fire district, or other governmental unit involved, and shall be qualified voters of the county, city, town, fire district, or other governmental unit involved. Two of these appointments shall be made from a list of four or more, submitted by the employees. If the request for arbitration is initiated by petition of the employees, the petition shall be accompanied by a list of four or more persons. If the request for arbitration is initiated by the county commission, council, board or other governing body having direction and control over the fire department, the chief executive officer of the county, city, town, fire district, or other governmental unit shall mail a copy of the resolution, together with a request for the submission of a list of four or more prospective members of the firemen's arbitration board to representatives of the employees of the fire department. The four members appointed by the chief executive officer shall select the fifth member of the board, who may or may not be a registered voter of the county, city, town, fire district, or other governmental unit involved. The board shall meet and organize as soon as possible after its appointment. The board shall select from its membership a chairman and any other officers it considers necessary, and make rules of procedure governing its hearings.

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(L. 1963 p. 415 § 2)

(1968) As applied to constitutional charter cities, §§ 290.350 and 290.360, RSMo, are unconstitutional and void as imposing duties upon a municipal officer. State ex rel. Burke v. Cervantes, 423 S.W.2d 791 (Mo.).

8/28/1963

**290.370. Hearing and recommendations of board.** — The board shall conduct hearings, with dispatch, for the purpose of hearing evidence relevant to the subject of the dispute, and shall, as soon as practicable, report its findings and recommendations in writing to the chief executive officer of the county, city, town, fire district, or other

governmental unit involved, and to any organization of firemen involved. The report shall be concurred in by at least three members of the board. The recommendation shall be advisory only and shall not be binding upon the county, city, town, fire district, or other governmental unit, or upon the members of the fire department involved.

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(L. 1963 p. 415 § 3)

8/28/1963

**290.380. Expenses of board members to be paid.** — Members of the board shall serve without compensation. All necessary expenses of any hearing conducted by the board members, certified to by all the members of the board, shall be paid by the county, city, town, fire district, or other governmental unit involved.

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(L. 1963 p. 415 § 4)

8/28/1963



**290.400. Definitions.** — As used in sections [290.400](#) to [290.450](#) the following words have the meanings indicated unless the context clearly requires otherwise:

- (1) "**Commission**", the labor and industrial relations commission of Missouri;
- (2) "**Employee**", every woman or man in receipt of or entitled to compensation for labor performed for any employer;
- (3) "**Employer**", every person, firm, corporation, agent, manager, representative, contractor, subcontractor, principal or other person having control or direction of any woman or man employed at any labor, or responsible directly or indirectly for the wages of another;
- (4) "**Female**", a woman of eighteen years or over;
- (5) "**Wage rates**" or "**wages**", any compensation for labor measured by time, piece, or otherwise.

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(L. 1963 p. 416 § 1)

8/28/1963

**290.410. Employer not to pay female lower wage.** — Notwithstanding any other provisions of the law, no employer shall pay any female in his employ at wage rates less than the wage rates paid to male employees in the same establishment for the same quantity and quality of the same classification of work, provided that nothing herein shall prohibit a variation of rates of pay for male and female employees

engaged in the same classification of work based upon a difference in seniority, length of service, ability, skill, difference in duties or services performed, difference in the shift or time of day worked, hours of work, or restrictions or prohibitions on lifting or moving objects in excess of specified weight, or other reasonable differentiation, or factors other than sex, when exercised in good faith.

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(L. 1963 p. 416 § 2)

8/28/1963

**290.420. Female may register complaint.** — Any affected female employee may register with the commission a complaint that the wages paid to her are less than the wages to which she is entitled under sections [290.400 to 290.450](#).

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(L. 1963 p. 416 § 4)

8/28/1963



**290.430. Labor and industrial relations commission to mediate wage disputes.** — The commission shall take all proceedings necessary to mediate the dispute concerning the payment of any sums alleged to be due and unpaid to the female employees. The commission shall have the power to issue such regulations not inconsistent with the purpose and provisions of sections [290.400 to 290.450](#), as it deems necessary or appropriate for the administration thereof.

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(L. 1963 p. 416 § 5, A.L. 1965 p. 95)

8/28/1965

**290.440. Female may recover wages, when — burden of proof.** — 1. Any employer who violates section [290.410](#) is liable to the female employee affected in the amount of the wages of which the female employee is deprived by reason of the violation.

2. Any female employee receiving less than the wage to which she is entitled under sections [290.400 to 290.450](#) may recover in a civil action the balance of the wages, together with the costs of suit, notwithstanding any agreement to work for a lesser wage.

3. The burden of proof shall be upon the person bringing the claim to establish that the differentiation in rate of pay is based upon the factor of sex and not upon other differences or factors.

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(L. 1963 p. 416 §§ 3, 6, 8)

8/28/1963

**290.450. Actions to be instituted in circuit court — limitations.** — Any action based upon or arising under sections 290.400 to 290.450 shall be instituted in the circuit court within six months after the date of the alleged violation, but in no event shall any employer be liable for any pay due under sections 290.400 to 290.450 for more than thirty days prior to receipt by the employer of written notice of claim thereof from the female employee.

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(L. 1963 p. 416 § 7)

8/28/1963



**290.460. Powers and duties of commission.** — The commission shall carry on a continuing program of education, information, study, and community organization concerning the problems of female employees in seeking, obtaining and holding employment without discrimination on account of sex. The commission's power and duties shall include but not be limited to the following:

- (1) Promote in cooperation with the federal government, state, local and private agencies and organizations, programs to eliminate discrimination in employment based solely on sex;
- (2) Promote research with the view to reducing barriers based solely on sex in the hire, employment and retention of female employees;
- (3) Sponsor and correlate in communities of the state, information and educational programs intended to reduce or abolish discrimination in employment based solely on sex;
- (4) Recommend to the governor, from time to time, any specific proposals for legislation as may be deemed necessary and proper for the elimination in employment of discrimination based solely on sex.

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(L. 1965 p. 439)

8/28/1965

**290.500. Definitions.** — As used in sections 290.500 to 290.530, the following words and phrases mean:

- (1) "**Agriculture**", farming and all its branches including, but not limited to, the cultivation and tillage of the soil, dairying, the production, cultivation, growing and harvesting of any agricultural commodities, the raising of livestock, fish and other marine life, bees, fur-bearing animals or poultry and any practices performed by a farmer or on a farm as an incident to or in conjunction with farming operations,

including preparation for market, delivery to storage or to market or to carriers for transportation to market;

(2) "**Director**", the director of the department of labor and industrial relations or his authorized representative;

(3) "**Employee**", any individual employed by an employer, except that the term "employee" shall not include:

(a) Any individual employed in a bona fide executive, administrative, or professional capacity;

(b) Any individual engaged in the activities of an educational, charitable, religious, or nonprofit organization where the employer-employee relationship does not, in fact, exist or where the services rendered to the organization are on a voluntary basis;

(c) Any individual standing in loco parentis to foster children in their care;

(d) Any individual employed for less than four months in any year in a resident or day camp for children or youth, or any individual employed by an educational conference center operated by an educational, charitable or not-for-profit organization;

(e) Any individual engaged in the activities of an educational organization where employment by the organization is in lieu of the requirement that the individual pay the cost of tuition, housing or other educational fees of the organization or where earnings of the individual employed by the organization are credited toward the payment of the cost of tuition, housing or other educational fees of the organization;

(f) Any individual employed on or about a private residence on an occasional basis for six hours or less on each occasion;

(g) Any handicapped person employed in a sheltered workshop, certified by the department of elementary and secondary education;

(h) Any person employed on a casual basis to provide baby-sitting services;

(i) Any individual employed by an employer subject to the provisions of part A of subtitle IV of title 49, United States Code, 49 U.S.C. §§ 10101 et seq.;

(j) Any individual employed on a casual or intermittent basis as a golf caddy, newsboy, or in a similar occupation;

(k) Any individual whose earnings are derived in whole or in part from sales commissions and whose hours and places of employment are not substantially controlled by the employer;



(l) Any individual who is employed in any government position defined in 29 U.S.C. §§ 203(e)(2)(C)(i)-(ii);

(m) Any individual employed by a retail or service business whose annual gross volume sales made or business done is less than five hundred thousand dollars;

(n) Any individual who is an offender, as defined in section 217.010, who is incarcerated in any correctional facility operated by the department of corrections, including offenders who provide labor or services on the grounds of such correctional facility pursuant to section 217.550;

(o) Any individual described by the provisions of section 29 U.S.C. 213(a) (8);

(4) "**Employer**", any person acting directly or indirectly in the interest of an employer in relation to an employee;

(5) "**Learner and apprentice**", any individual under 20 years of age who has not completed the required training for a particular job. In no event shall the individual be deemed a learner or apprentice in the occupation after three months of training except where the director finds, after investigation, that for the particular occupation a minimum of proficiency cannot be acquired in three months. In no case shall a person be declared to be a learner or apprentice after six months of training for a particular employer or job. Employees of an amusement or recreation business that meets the criteria set out in 29 U.S.C. § 213(a) (3) may be deemed a learner or apprentice for ninety working days. No individual shall be deemed a learner or apprentice solely for the purpose of evading the provisions of sections 290.500 to 290.530;

(6) "**Occupation**", any occupation, service, trade, business, industry, or branch or group of industries or employment or class of employment in which individuals are gainfully employed;

(7) "**Wage**", compensation due to an employee by reason of his employment, payable in legal tender of the United States or checks on banks convertible into cash on demand at full face value;

(8) "**Person**", any individual, partnership, association, corporation, business, business trust, legal representative, or any organized group of persons;

(9) "**Man-day**", any day during which an employee performs any agricultural labor for not less than one hour.

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(L. 1990 H.B. 1881 § 1, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006

**290.502. Minimum wage rate — increase or decrease, when.** — 1. Except as may be otherwise provided pursuant to sections 290.500 to 290.530, effective January 1, 2007, every employer shall pay to each employee wages at the rate of \$6.50 per hour, or wages at the same rate or rates set under the provisions of federal law as the prevailing federal minimum wage applicable to those covered jobs in interstate commerce, whichever rate per hour is higher.

2. The minimum wage shall be increased or decreased on January 1, 2008, and on January 1 of successive years, by the increase or decrease in the cost of living. On September 30, 2007, and on each September 30 of each successive year, the director shall measure the increase or decrease in the cost of living by the percentage increase or decrease as of the preceding July over the level as of July of the immediately preceding year of the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) or successor index as published by the U.S. Department of Labor or its successor agency, with the amount of the minimum wage increase or decrease rounded to the nearest five cents.

3. Except as may be otherwise provided pursuant to sections 290.500 to 290.530, and notwithstanding subsection 1\* of this section, effective January 1, 2019, every employer shall pay to each employee wages at the rate of not less than \$8.60 per hour, or wages at the same rate or rates set under the provisions of federal law as the prevailing federal minimum wage applicable to those covered jobs in interstate commerce, whichever rate per hour is higher. Thereafter, the minimum wage established by this subsection shall be increased each year by \$.85 per hour, effective January 1 of each of the next four years, until it reaches \$12.00 per hour, effective January 1, 2023. Thereafter, the minimum wage established by this subsection shall be increased or decreased on January 1, 2024, and on January 1 of successive years, per the method set forth in subsection 2\*\* of this section. If at any time the federal minimum wage rate is above or is thereafter increased above the minimum wage then in effect under this subsection, the minimum wage required by this subsection shall continue to be increased pursuant to this subsection \*\*\*, but the higher federal rate shall immediately become the minimum wage required by this subsection and shall be increased or decreased per the method set forth in subsection 2\*\* for so long as it remains higher than the state minimum wage required and increased pursuant to this subsection.

4. For purposes of this section, the term "**public employer**" means an employer that is the state or a political subdivision of the state, including a department, agency, officer, bureau, division, board, commission, or instrumentality of the state, or a city,

county, town, village, school district, or other political subdivision of the state. Subsection 3\*\*\*\* of this section shall not apply to a public employer with respect to its employees. Any public employer that is subject to subsections 1\* and 2\*\* of this section shall continue to be subject to those subsections.

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(L. 1990 H.B. 1881 § 2, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006, A.L. 2018 Adopted by Initiative, Proposition B, November 6, 2018)

Effective 11-06-18

\*Words "subsection (1)" appear in original rolls.

\*\*Words "subsection (2)" appear in original rolls.

\*\*\*Number "(3)" appears here in original rolls.

\*\*\*\*Words "subsection (3)" appear in original rolls.

11/6/2018



**290.505. Overtime compensation, applicable number of hours, exceptions. —**

1. No employer shall employ any of his employees for a workweek longer than forty hours unless such employee receives compensation for his employment in excess of the hours above specified at a rate not less than one and one-half times the regular rate at which he is employed.

2. Employees of an amusement or recreation business that meets the criteria set out in 29 U.S.C. 213(a)(3) must be paid one and one-half times their regular compensation for any hours worked in excess of fifty-two hours in any one-week period.

3. With the exception of employees described in subsection (2), the overtime requirements of subsection (1) shall not apply to employees who are exempt from federal minimum wage or overtime requirements including, but not limited to, the exemptions or hour calculation formulas specified in 29 U.S.C. Sections 207 and 213, and any regulations promulgated thereunder.

4. Except as may be otherwise provided under sections [290.500 to 290.530](#), this section shall be interpreted in accordance with the Fair Labor Standards Act, 29 U.S.C. Section 201, et seq., as amended, and the Portal to Portal Act, 29 U.S.C. Section 251, et seq., as amended, and any regulations promulgated thereunder.

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(L. 1990 H.B. 1881 § 3, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006, A.L. 2008 H.B. 1883 merged with H.B. 2041)

Effective 6-25-08 (H.B. 2041); 8-28-08 (H.B. 1883)

8/28/2008

**290.507. Agriculture, law not applicable.** — Sections 290.500 to 290.530 shall not apply to any employee or employer engaged in agriculture, as defined in section 290.500 (A) if such employee is employed by an employer who did not, during any calendar quarter during the preceding calendar year, use more than five hundred man-days of agriculture labor, (B) if such employee is the parent, spouse, child, or other member of his employer's immediate family, (C) if such employee (i) is employed as a hand harvest laborer and is paid on a piece rate basis in an operation which has been, and is customarily and generally recognized as having been, paid on a piece rate basis in the region of employment, (ii) commutes daily from his permanent residence to the farm on which he is so employed, and (iii) has been employed in agriculture less than thirteen weeks during the preceding calendar year, (D) if such employee (other than an employee described in clause (C) of this subsection) (i) is sixteen years of age or under and is employed as a hand harvest laborer, is paid on a piece rate basis in an operation which has been, and is customarily and generally recognized as having been, paid on a piece rate basis in the region of employment, (ii) is employed on the same farm as his parent or person standing in the place of his parent, and (iii) is paid at the same piece rate as employees over age sixteen are paid on the same farm, or (E) if such employee is principally engaged in the range production of livestock.

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(L. 1990 H.B. 1881 § 4, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006

**290.510. Director may investigate to prove compliance.** — The director shall have authority to investigate and ascertain the wages of persons employed in any occupation included within the meaning of sections 290.500 to 290.530.

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(L. 1990 H.B. 1881 § 5, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006



**290.512. Gratuities, goods or services as part of wages, effect on minimum wage requirements.** — 1. No employer of any employee who receives and retains compensation in the form of gratuities in addition to wages is required to pay wages in excess of fifty percent of the minimum wage rate specified in sections 290.500 to 290.530, however, total compensation for such employee shall total at least the minimum wage specified in sections 290.500 to 290.530, the difference being made up by the employer.

2. If an employee receives and retains compensation in the form of goods or services as an incident of his employment and if he is not required to exercise any discretion in order to receive the goods or services, the employer is required to pay only the difference between the fair market value of the goods and services and the minimum wage otherwise required to be paid by sections 290.500 to 290.530. The fair market value of the goods and services shall be computed on a weekly basis. The director shall provide by regulation a method of valuing the goods and services received by any employee in lieu of the wages otherwise required to be paid under the provisions of sections 290.500 to 290.530. He shall also provide by regulation a method of determining those types of goods and services that are an incident of employment the receipt of which does not require any discretion on the part of the employee.

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(L. 1990 H.B. 1881 § 6, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006

**290.515. Physical or mental deficiency of employee, wage rate, determined by director, how.** — After a public hearing at which any person may be heard, the director shall provide by regulation for the employment in any occupation of individuals whose earning capacity is impaired by physical or mental deficiency at wages lower than the wage rate applicable under sections 290.500 to 290.530. The individuals shall be employed as the director finds appropriate to prevent curtailment of opportunities for employment, to avoid undue hardship, and to safeguard the wage rate applicable under sections 290.500 to 290.530, except that no individual who maintains a production level within the limits required of other employees shall be paid less than the wage rate applicable under sections 290.500 to 290.530. Employees affected or their guardians shall be given reasonable notice of this hearing.

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(L. 1990 H.B. 1881 § 7, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006

**290.517. Learners and apprentices, wage rate, determined by director, how.** — After a public hearing of which individual employees affected must be given reasonable notice, the director shall provide by regulation for the employment in any occupation, at wages lower than the wage rate applicable under sections 290.500 to 290.530, of such learners and apprentices as he finds appropriate to prevent curtailment of opportunities for employment. Such wage rate for learners and apprentices shall be not less than 90 cents less than the minimum wage established by

sections [290.500 to 290.530](#). At no time may this provision be used for the purpose of evading the spirit and meaning of sections [290.500 to 290.530](#).

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(L. 1990 H.B. 1881 § 8, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006



**290.520. Employer to keep records — director may inspect, records to be confidential.** — Every employer subject to any provision of sections [290.500 to 290.530](#) or any regulation issued under sections [290.500 to 290.530](#) shall make and keep for a period of not less than three years on or about the premises wherein any employee is employed or at some other premises which is suitable to the employer, a record of the name, address and occupation of each of his employees, the rate of pay, the amount paid each pay period to each employee, the hours worked each day and each workweek by the employee and any goods or services provided by the employer to the employee as provided in section [290.512](#). The records shall be open for inspection by the director by appointment. Where the records required under this section are kept outside the state, the records shall be made available to the director upon demand. Every such employer shall furnish to the director on demand a sworn statement of time records and information upon forms prescribed or approved by the director. All the records and information obtained by the department of labor and industrial relations are confidential and shall be disclosed only on order of a court of competent jurisdiction.

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(L. 1990 H.B. 1881 § 9, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006

**290.522. Summary of law and wage rate, employer to post, how.** — Every employer subject to any provision of sections [290.500 to 290.530](#) or of any regulations issued under sections [290.500 to 290.530](#) shall keep a summary of sections [290.500 to 290.530](#), approved by the director, and copies of any applicable wage regulations issued under sections [290.500 to 290.530](#), or a summary of the wage regulations posted in a conspicuous and accessible place in or about the premises wherein any person subject thereto is employed. Employers shall be furnished copies of the summaries and regulations by the state on request without charge.

(L. 1990 H.B. 1881 § 10, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006

**290.523. Rulemaking authority.** — The department may, in accordance with [chapter 536](#), promulgate such rules and regulations as are necessary for the enforcement and administration of sections [290.500 to 290.530](#). Any rule or portion of a rule, as that term is defined in section [536.010](#), that is created under the authority delegated in this section shall become effective only if it complies with and is subject to all of the provisions of [chapter 536](#) and, if applicable, section [536.028](#). This section and [chapter 536](#) are nonseverable and if any of the powers vested with the general assembly pursuant to [chapter 536](#) to review, to delay the effective date, or to disapprove and annul\* a rule are subsequently held unconstitutional, then the grant of rulemaking authority and any rule proposed or adopted after August 28, 2008, shall be invalid and void.

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(L. 2008 H.B. 1883 merged with H.B. 2041)

\*Word "annual" appears in original rolls of H.B. 1883, 2008.

8/28/2008



**290.525. Violations — penalty.** — Any employer who hinders the director in the performance of his duties in the enforcement of sections [290.500 to 290.530](#) by any of the following acts is guilty of a class C misdemeanor:

- (1) Refusing to admit the director to any place of employment;
- (2) Failing to make, keep and preserve any records as required under the provisions of sections [290.500 to 290.530](#);
- (3) Falsifying any record required under the provisions of sections [290.500 to 290.530](#);
- (4) Refusing to make any record required under the provisions of sections [290.500 to 290.530](#) accessible to the director;
- (5) Refusing to furnish a sworn statement of any record required under the provisions of sections [290.500 to 290.530](#) or any other information required for the proper enforcement of sections [290.500 to 290.530](#) to the director upon demand;
- (6) Failing to post a summary of sections [290.500 to 290.530](#) or a copy of any applicable regulation as required;

(7) Discharging or in any other manner discriminating against any employee who has notified the director that he has not been paid wages in accordance with the provisions of sections 290.500 to 290.530, or who has caused to be instituted any proceeding under or related to sections 290.500 to 290.530, or who has testified or is about to testify in any such proceeding;

(8) Paying or agreeing to pay wages at a rate less than the rate applicable under sections 290.500 to 290.530. Payment at such rate for any week or portion of a week constitutes a separate offense as to each employee;

(9) Otherwise violating any provisions of sections 290.500 to 290.530.

Each day of violation constitutes a separate offense.

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(L. 1990 H.B. 1881 § 11, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006

**290.527. Action for underpayment of wages, employee may bring — limitation. —** Any employer who pays any employee less wages than the wages to which the employee is entitled under or by virtue of sections 290.500 to 290.530 shall be liable to the employee affected for the full amount of the wage rate and an additional amount equal to twice the unpaid wages as liquidated damages, less any amount actually paid to the employee by the employer and for costs and such reasonable attorney fees as may be allowed by the court or jury. The employee may bring any legal action necessary to collect the claim. Any agreement between the employee and the employer to work for less than the wage rate shall be no defense to the action. All actions for the collection of any deficiency in wages shall be commenced within three years of the accrual of the cause of action.

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(L. 1990 H.B. 1881 § 12, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006, A.L. 2018 Adopted by Initiative, Proposition B, November 6, 2018)

Effective 11-06-18

11/6/2018

**290.528. Minimum wage and employment benefits, limitations on political subdivisions. —** 1. As used in this section, the following terms shall mean:

(1) "Employee", an individual employed in this state by an employer;

(2) "Employer", any individual, sole proprietorship, partnership, limited liability company, corporation, or any other entity that is legally doing business in this state;



except that, the term "employer" shall not include any public employer, as defined in section [285.525](#);

(3) "**Employment benefits**", anything of value that an employee may receive from an employer in addition to wages and salary. The term includes, but is not limited to, health, disability, retirement, profit-sharing, and death benefits; group accidental death and dismemberment benefits; paid or unpaid days off from work for holidays, sick leave, vacation, and personal necessity; and terms of employment, attendance, or leave policies;

(4) "**Political subdivision**", any municipality, special district, local governmental body, county, city, town, or village.

2. Notwithstanding any other provisions of law to the contrary, no political subdivision shall establish, mandate, or otherwise require an employer to provide to an employee:

- (1) A minimum or living wage rate; or
- (2) Employment benefits;

that exceed state laws, rules, or regulations. Sections [290.500 to 290.530](#) shall preempt and nullify all political subdivision ordinances, rules, and regulations currently in effect or later enacted relating to the establishment or enforcement of a minimum or living wage or the provision of employment benefits that exceed state laws, rules, or regulations.

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(L. 1990 H.B. 1881 § 13, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006, A.L. 2017 H.B. 1194 & 1193)

8/28/2017



**290.529. Severability clause.** — Except in the circumstances set forth in section [290.523](#), all the provisions of sections [290.500 to 290.530](#) are severable. If any provision, including any section, subsection, subdivision, paragraph, sentence, or clause, of sections [290.500 to 290.530](#), or the application thereof to any person or circumstance, is found by a court of competent jurisdiction to be invalid, unconstitutional, or unconstitutionally enacted, such decision shall not affect other provisions or applications of sections [290.500 to 290.530](#) that can be given effect without the invalid, unconstitutional, or unconstitutionally enacted provision or application.

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(L. 2018 Adopted by Initiative, Proposition B, November 6, 2018)

Effective 11-06-18

11/6/2018

**290.530. Law not to interfere with collective bargaining rights.** — Nothing in sections [290.500 to 290.530](#) shall be deemed to interfere with, impede, or in any way diminish the right of employees to bargain collectively with their employers through representatives of their own choosing in order to establish wages or other conditions of work in excess of the applicable minimum under the provisions of sections [290.500 to 290.530](#).

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(L. 1990 H.B. 1881 § 14, A.L. 2006 Adopted by Initiative, Proposition B, November 7, 2006)

12/7/2006

**290.550. Definitions.** — As used in sections [290.550 to 290.580](#), the following terms mean:

(1) "**Laborers from nonrestrictive states**", persons who are residents of a state which has not enacted state laws restricting Missouri laborers from working on public works projects in that state, as determined by the labor and industrial relations commission;

(2) "**Missouri laborer**", any person who has resided in Missouri for at least thirty days and intends to become or remain a Missouri resident;

(3) "**A period of excessive unemployment**", any month immediately following two consecutive calendar months during which the level of unemployment in the state has exceeded five percent as measured by the United States Bureau of Labor Statistics in its monthly publication of employment and unemployment figures;

(4) "**Public works**", projects defined as public works pursuant to section [290.210](#).

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(L. 1993 H.B. 416 & 417 § 1)

8/28/1993



**290.555. Law to apply to certain projects.** — Sections [290.550 to 290.580](#) apply to all labor on public works projects or improvements, whether skilled, semiskilled or unskilled, and whether manual or nonmanual except work done directly by any public utility company and not let to contract.

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(L. 1993 H.B. 416 & 417 § 2)

8/28/1993

**290.560. Certain laborers to be used on public works projects, when — contract provisions — exceptions.** — Whenever there is a period of excessive unemployment in this state, every person who is charged with the duty, either by law or contract, of constructing or building any public works project or improvement for the state or any political subdivision, municipal corporation or other governmental unit thereof shall employ only Missouri laborers and laborers from nonrestrictive states on such project or improvement, and every contract let by any such person shall contain a provision requiring that such labor be used, except that other laborers may be used when Missouri laborers or laborers from nonrestrictive states are not available, or are incapable of performing the particular type of work involved, if so certified by the contractor and approved by the contracting officer.

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(L. 1993 H.B. 416 & 417 § 3)

8/28/1993

**290.565. Law not to apply to certain personnel.** — The provisions of sections [290.550](#) to [290.580](#) shall not apply to regularly employed nonresident executive, supervisory or technical personnel.

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(L. 1993 H.B. 416 & 417 § 4)

8/28/1993

**290.570. Federal projects, statutes not enforced, when.** — In all contracts involving the expenditure of federal aid funds, sections [290.550](#) to [290.580](#) shall not be enforced in such manner as to conflict with any federal statutes or rules and regulations.

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(L. 1993 H.B. 416 & 417 § 5)

8/28/1993

**290.575. Penalties for failure to use certain laborers, when.** — Any person who knowingly fails to use Missouri laborers or laborers from nonrestrictive states as required in section [290.560](#) shall be guilty of an infraction. Each separate case of failure to use Missouri laborers or laborers from nonrestrictive states on such public works projects or improvements shall constitute a separate offense.

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(L. 1993 H.B. 416 & 417 § 6)

8/28/1993

**290.580. Department to enforce law — injunctive relief, when.** — Sections [290.550](#) to [290.580](#) shall be enforced by the department of labor and industrial relations, which, as represented by the attorney general, is empowered to sue for injunctive relief

against the awarding of any contract or the continuation of any work under any contract for public works or improvements at a time when the provisions of sections 290.550 to 290.580 are not being met.

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(L. 1993 H.B. 416 & 417 § 7)

8/28/1993

**\*290.590. Labor organization membership, dues, and fees not required as condition of employment – definitions – violations, penalty – investigation of complaints – inapplicability, when. – 1.** As used in this section, the following terms shall mean:

(1) "**Employer**", any individual, organization, partnership, state agency, political subdivision, corporation, or other legal entity which employs or has employed one or more individuals performing services for the entity within this state; and

(2) "**Labor organization**", any organization of any kind or agency, or employee representation committee or union which exists for the purpose in whole or in part of dealing with employers concerning wages, rates of pay, hours of work, other conditions of employment, or other forms of compensation.

2. No person shall be required as a condition or continuation of employment to:

(1) Become, remain, or refrain from becoming a member of a labor organization;

(2) Pay any dues, fees, assessments, or other similar charges however denominated of any kind or amount to a labor organization; or

(3) In lieu of the payments listed under subdivision (2) of this subsection, pay to any charity or other third party any amount equivalent to, or on a pro rata basis, any dues, fees, assessments, or other charges required of members of a labor organization.

3. Any agreement, understanding, or practice, written or oral, implied or expressed, between any labor organization and employer that violates the rights of employees as guaranteed under this section is unlawful, null and void, and of no legal effect.

4. Any person who violates or directs another to violate any provision of this section shall be guilty of a class C misdemeanor.

5. (1) Any person injured as a result of any violation or threatened violation of this section shall be entitled to injunctive relief against any and all violators or persons threatening violations.

(2) Any person injured as a result of any violation or threatened violation of this section may recover any and all damages of any character resulting from such

violation or threatened violation including costs and reasonable attorney fees. Such remedies shall be independent of and in addition to the other penalties and remedies prescribed under this section.

6. The prosecuting attorney or circuit attorney with jurisdiction over the location where a violation or threatened violation of this section occurs or the attorney general of this state shall investigate complaints of violation or threatened violation of this section, prosecute any person violating this section, and use all means at their command to ensure the effective enforcement of this section.

7. This section shall not apply:

- (1) To employers and employees covered by the federal Railway Labor Act;
- (2) To federal employers and employees;
- (3) To employers and employees on exclusive federal enclaves;
- (4) Where this section conflicts with or is preempted by federal law; or
- (5) To any agreement between an employer and a labor organization entered into before August 28, 2017, but shall apply to any such agreement upon its renewal, extension, amendment, or modification in any respect after August 28, 2017.

-----  
(L. 2017 S.B. 19, Rejected by Referendum, Proposition A, August 7, 2018)

\*Revisor's Note: On February 21, 2017, a petition for referendum (Chapter 116, RSMo) on Senate Substitute No. 2 for Senate Bill No. 19 was received by the Secretary of State's Office. On March 28, 2017, the official ballot title was certified by the Secretary of State (Section 116.180, RSMo) and approved for circulation in accordance with Article III, Section 52(a). On August 18, 2017, the Secretary of State's Office received 163 boxes of referendum petitions for Senate Substitute No. 2 for Senate Bill No. 19. On November 22, 2017, the Secretary of State issued a certificate of sufficiency certifying the referendum petition. The referendum petition was to be placed on the November 6, 2018, ballot unless a different date was designated by the General Assembly. The General Assembly, in SCR 49 enacted on May 24, 2018, designated the referendum vote to be held on August 7, 2018. The measure was rejected by referendum, Proposition A, on August 7, 2018.

8/28/2017

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In accordance with Section **3.090**, the language of statutory sections enacted during a legislative session are updated and available on this website **on the effective date** of such enacted statutory section.



- ▶ **Other Links**
- ▶ **Other Information**



**Missouri Senate**



**MO.gov**



**Missouri House**

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Site errors / suggestions - [webmaster@LR.mo.gov](mailto:webmaster@LR.mo.gov)



**Our flag's story**





**DIVISION OF  
LABOR  
STANDARDS**

**MISSOURI DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS  
PREVAILING WAGE  
PROJECT NOTIFICATION –  
CONTRACTOR INFORMATION**

New     Update

The information below is requested pursuant to Sections 290.210 through 290.340, RSMo.

1. Date of Notification		2. Annual Wage Order Number Included in Bid Specifications	
3. Popular or Descriptive Name of Project			
4. Estimated Project Cost of Completion (total construction contracts to be awarded)		\$	
5. Exact Location of Project		County	City
6. Official Name of Public Body or Agency			
7. Name of Contact Person			8. Phone Number (include area code)
9. Address			
10. Email Address		Website	
11. Contract Award Date	12. Estimated Date of Project Completion	13. Will There Be Any Federal Funds Used in this Contract?	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	

**14. Contractor Information Notification**

**General Contractor:**    Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
 Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
 Type of Craftsmen Needed by Project \_\_\_\_\_  
 Scope of Work \_\_\_\_\_

**List all Subcontractors:**

**1. Name** \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
 Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
 Type of Craftsmen Needed by Project \_\_\_\_\_  
 Scope of Work \_\_\_\_\_

**2. Name** \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
 Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
 Type of Craftsmen Needed by Project \_\_\_\_\_  
 Scope of Work \_\_\_\_\_

**3. Name** \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
 Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
 Type of Craftsmen Needed by Project \_\_\_\_\_  
 Scope of Work \_\_\_\_\_

(Subcontractors continued)

4. Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
Type of Craftsmen Needed by Project \_\_\_\_\_  
Scope of Work \_\_\_\_\_

5. Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
Type of Craftsmen Needed by Project \_\_\_\_\_  
Scope of Work \_\_\_\_\_

6. Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
Type of Craftsmen Needed by Project \_\_\_\_\_  
Scope of Work \_\_\_\_\_

7. Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
Type of Craftsmen Needed by Project \_\_\_\_\_  
Scope of Work \_\_\_\_\_

8. Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
Type of Craftsmen Needed by Project \_\_\_\_\_  
Scope of Work \_\_\_\_\_

9. Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_  
Type of Craftsmen Needed by Project \_\_\_\_\_  
Scope of Work \_\_\_\_\_

The state of Missouri requires workers on public works projects be paid the prevailing wage. Public bodies have duties as required under Section 290.210 - 290.340, RSMo.

Mail, Fax, or Email completed form to: **DIVISION OF LABOR STANDARDS**  
Attn: Prevailing Wage Section  
P.O. Box 449, Jefferson City, MO 65102-0449  
Phone: 573-751-3405 Fax: 573-751-3721  
Email: [prevailingwage@labor.mo.gov](mailto:prevailingwage@labor.mo.gov)  
Website: [www.labor.mo.gov/DLS](http://www.labor.mo.gov/DLS)

**SUBMIT**

Missouri Department of Labor and Industrial Relations is an equal opportunity employer/program.  
TDD/TTY: 800-735-2966 Relay Missouri: 711





**DIVISION OF  
LABOR  
STANDARDS**

**MISSOURI DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS  
AFFIDAVIT  
COMPLIANCE WITH THE PREVAILING WAGE LAW**

I, \_\_\_\_\_, upon being duly sworn upon my oath state that: (1) I am the  
*(Name)*  
\_\_\_\_\_ of \_\_\_\_\_; (2) all requirements of  
*(Title)* *(Name of Company)*  
§§ 290.210 to 290.340, RSMo, pertaining to the payment of wages to workers employed on public works projects  
have been fully satisfied with regard to this company's work on \_\_\_\_\_;  
*(Name of Project)*

(3) I have reviewed and am familiar with the prevailing wage rules in 8 CSR 30-3.010 to 8 CSR 30-3.060; (4) based upon my knowledge of these rules, including the occupational titles set out in 8 CSR 30-3.060, I have completed full and accurate records clearly indicating (a) the names, occupations, and crafts of every worker employed by this company in connection with this project together with an accurate record of the number of hours worked by each worker and the actual wages paid for each class or type of work performed, (b) the payroll deductions that have been made for each worker, and (c) the amounts paid to provide fringe benefits, if any, for each worker; (5) the amounts paid to provide fringe benefits, if any, were irrevocably made to a fund, plan, or program on behalf of the workers; (6) these payroll records are kept and have been provided for inspection to the authorized representative of the contracting public body and will be available, as often as may be necessary, to such body and the Missouri Department of Labor and Industrial Relations; (7) such records shall not be destroyed or removed from the state for one year following the completion of this company's work on this project; and (8) there has been no exception to the full and complete compliance with the provisions and requirements of Annual Wage Order No. \_\_\_\_\_ Section \_\_\_\_\_ issued by the Missouri Division of Labor Standards and applicable to this project located in \_\_\_\_\_ County, Missouri, and completed on the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

The matters stated herein are true to the best of my information, knowledge, and belief. I acknowledge that the falsification of any information set out above may subject me to criminal prosecution pursuant to §§290.340, 570.090, 575.040, 575.050, or 575.060, RSMo.

\_\_\_\_\_  
Signature

Subscribed and sworn to me this \_\_\_\_\_ day of \_\_\_\_\_,  
My commission expires \_\_\_\_\_.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
Receipt by Authorized Public Representative



**ADDENDUM NUMBER** \_\_\_\_\_

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

ISSUE DATE: \_\_\_\_\_

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:

The Bid date for this Project stated in Document 00130 - Invitation to Bid shall be changed to: 2:00 PM, on \_\_\_\_\_.

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

*[NOTE: Include items under this heading such as Pre-bid meeting attendance list, soils report, etc.; items that should **not** be contractual, but are useful information to Bidders. Delete this heading and introduction if not applicable for this Addendum. Be certain to remove this note before final document is printed.]*

- 1.
- 2.

Q1.	
A1.	
Q2.	
A2.	
Q3.	
A3.	

Bidding Requirements

1. Add the following section(s):
  - a. Document, Sec. \_\_, Subparagraph \_\_, Page \_\_\_\_
  - b. Document, Sec. \_\_, Subparagraph \_\_, Page \_\_\_\_

**[OR]**

2. Delete the following section(s):
  - a. Document, Sec. \_\_, Subparagraph \_\_, Page \_\_\_\_
  - b. Document, Sec. \_\_, Subparagraph \_\_, Page \_\_\_\_

**[OR]**

3. Delete and replace the following section(s):

- a. Delete Document, Sec. \_\_, Subparagraph \_\_, Page \_\_\_ and replace with the following Document, Sec. \_\_, Subparagraph \_\_, Page \_\_\_:
- b. Delete Document, Sec. \_\_, Subparagraph \_\_, Page \_\_\_ and replace with the following Document, Sec. \_\_, Subparagraph \_\_, Page \_\_\_:

Contracting Requirements

- 1.
- 2.

Specifications

- 1.
- 2.

Drawings:

- 1.
- 2.

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



# REQUEST FOR INTERPRETATION

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

Contractor \_\_\_\_\_

RFI Number \_\_\_\_\_ Date \_\_\_\_\_

From: \_\_\_\_\_

To: \_\_\_\_\_

Re: \_\_\_\_\_

Spec. Sec. Ref:

Paragraph:

Drawing Ref:

Detail:

Signed: \_\_\_\_\_

Response: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Attachments

Response From:

To:

Date Transmitted: \_\_\_\_\_ Date Rec'd: \_\_\_\_\_

Signed: \_\_\_\_\_

Design Professional

Signed: \_\_\_\_\_

Owner's Representative

Distribution:

Owner

Contractor

Construction Manager

Design Professional

Consultant \_\_\_\_\_

Other \_\_\_\_\_





## SUPPLEMENTAL DESIGN INSTRUCTION

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

To Contractor \_\_\_\_\_

From: \_\_\_\_\_ SDI No \_\_\_\_\_ Issue Date: \_\_\_\_\_

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Price or Contract Times. Proceeding with the Work in accordance with these instructions indicates your acknowledgement that there will be no change in the Contract Price or Contract Times.

Description:

Attachments (*List*)

(Signature) Design Professional

Date

- Distribution:
- Owner
  - Contractor
  - Construction Manager
  - Design Professional
  - Consultant \_\_\_\_\_
  - Other \_\_\_\_\_



## REQUEST FOR PROPOSAL

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

To Contractor \_\_\_\_\_

From: \_\_\_\_\_ RFP No \_\_\_\_\_ Issue Date: \_\_\_\_\_

---

Please submit an itemized proposal for changes in the Contract Price and Contract Times for proposed modifications to the Contract Documents described herein. Submit proposal within \_\_\_\_\_ days, or notify the Owner in writing of the date on which you anticipate submitting your proposal.

This is NOT a Change Order, a Work Change Directive or a direction to proceed with the work described in the proposed modifications.

---

Description:

Attachments

---

Prepared by Design Professional

---

Prepared by Construction Manager

---

REQUESTED by OWNER'S Representative

---

- Distribution:
- Owner
  - Contractor
  - Construction Manager
  - Design Professional
  - Consultant \_\_\_\_\_
  - Other \_\_\_\_\_



**REQUEST FOR PROPOSAL LOG**

Project/Contract Numbers: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

CONTRACTOR \_\_\_\_\_

OWNER \_\_\_\_\_

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





# CHANGE ORDER

**Project/Contract Numbers:** 81000812/1541

**Project Title:** Waste Water Treatment Building - Blue River  
Annex - Bid #2

Change Order No: \_\_\_\_\_ Date of Issuance: \_\_\_\_\_

Ordinance No: \_\_\_\_\_ Ordinance Effective Date: \_\_\_\_\_  
Contract Notice To Proceed Date: \_\_\_\_\_

To CONTRACTOR:

The Contract is changed as follows: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

This Change Order constitutes compensation in full on behalf of the Contractor and its subcontractors and suppliers for all costs, including impact costs and extended general conditions, and markups directly and indirectly attributable to the Work changes ordered herein, for all delays related thereto and for performance of the changes within the time stated. Contractor hereby releases all claims for delay, interruption, extended general conditions, impact and cumulative impact claims for this Work.

[Note: Identify the specific attachments; example: "Attachment A, Additional Scope of Services." Delete all notes before printing final]

See Attached Document(s).

[Note: If the CO does not change the Contract Price, use "Director" instead of "Director of Finance"]

**Not valid until signed by the Director of Finance.**

The original Contract Price was	\$0.00
Net change by previously authorized Change Orders	\$0.00
The Contract Price prior to this Change Order was	\$0.00
The Contract Price will be ( <input type="checkbox"/> increased by) ( <input type="checkbox"/> decreased by) ( <input type="checkbox"/> unchanged)	\$0.00
The new Contract Price including this Change Order will be	\$0.00
[Note: If revised, establish and enter new dates. If unchanged, enter current contract dates.	
If you are only changing the Final Completion date, add the following reference:	
"The Contract Time for Final Completion will be . . ."]	
The Contract Time will be ( <input type="checkbox"/> increased by) ( <input type="checkbox"/> decreased by) ( <input type="checkbox"/> unchanged)	( ) calendar days
The date of Substantial Completion as of the date of this Change Order therefore is	Enter Date
The date of Final Completion as of the date of this Change Order therefore is	Enter Date

Project No. & Title  
 Change Order No.

[Note: Include any required additional signatures.]

<b>DESIGN PROFESSIONAL:</b>	<b>By:</b>	<b>Date:</b>
	<b>Title:</b>	
<b>CONTRACTOR:</b>	<b>By:</b>	<b>Date:</b>
	<b>Title:</b>	
<b>CITY:</b>	<b>By</b>	<b>Date:</b>
	<b>Title:</b>	

Approved as to form: \_\_\_\_\_  
 Assistant City Attorney

[Note: If this CO does not change the Contract Price, delete the cert. of funds by Finance Director but send signed copy to Finance.]

I certify there is a balance otherwise unencumbered to the credit of the appropriation to which the above amount is chargeable, and a cash balance otherwise unencumbered in the treasury to the credit of the fund from which payment is to be made, each sufficient to meet the above obligation.

\_\_\_\_\_  
 Director of Finance By: \_\_\_\_\_ Date

- Distribution:  CITY  
 CONTRACTOR  
 DESIGN PROFESSIONAL

**REMINDER:** CONTRACTOR is responsible for considering the effect this Change Order may have on its ability to meet or exceed the D/M/WBE participation amounts in its Contractor Utilization Plan (CUP) as amended by any previously approved Request for Modification/Substitution. If CONTRACTOR will not be able to achieve the approved participation amounts in performing the work included within this Change Order, or if CONTRACTOR needs to retain the services of additional D/M/WBEs not previously listed in its CUP, CONTRACTOR is advised to submit a Request for Modification/Substitution.



# WORK CHANGE DIRECTIVE

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

No.: \_\_\_\_\_ Date of Issuance: \_\_\_\_\_

TO:  
(CONTRACTOR)

You are directed to proceed promptly with the following work:

Description:

Purpose of Work Change Directive:

Attachments: *(List documents supporting change)*

If the above work results on a change in the Contract Price or Contract Times, any request for a Change Order based thereon will involve one or more of the following methods of determining the effect of the change(s).

Method of determining change in  
Contract Price:

Method of determining change in  
Contract Times:

- Unit Prices
- Lump Sum
- As Stipulated in General Conditions
- Other \_\_\_\_\_

- CONTRACTOR's Records
- DESIGN PROFESSIONAL's Records
- City's Records
- Other \_\_\_\_\_

Estimated increase (decrease) in Contract Price:  
\$ \_\_\_\_\_

Estimated increase (decrease) in Contract Times:  
Substantial Completion: \_\_\_\_\_ days;

If the change involves an increase, the estimated Amount is not to be exceeded without further authorization.

Final Completion: \_\_\_\_\_ days.  
If the change involves an increase, the estimated times are not to be exceeded without further authorization.

Recommended:

Recommended:

Recommended:

DESIGN PROFESSIONAL

Construction Manager

City

By (Authorized Signature)

By (Authorized Signature)

By (Authorized Signature)

Distribution:

- City
- Contractor
- Construction Manager

- Design Professional
- Consultant
- Other

# WORK CHANGE DIRECTIVE (“WCD”) INSTRUCTIONS

---

**[Note: Do not attach these instructions to the WCD Form]**

## **A. GENERAL INFORMATION**

This document was developed for use in situations involving changes in the Work which, if not processed expeditiously, might delay the Project. These changes are often initiated in the field and may affect the Contract Price or the Contract Times. This is not a Change Order, but only a directive to proceed with Work that may be included in a subsequent Change Order. If the WCD may result in an increase in the Contract Price, a contract impact cost analysis must be performed prior to issuing the WCD. Availability of funds and authorization to expend funds must be part of the analysis.

For supplemental instructions and minor changes not involving a possible change in the Contract Price or the Contract Times a Supplemental Design Instruction may be used.

## **B. COMPLETING THE WORK CHANGE DIRECTIVE FORM**

Based on conversations between Design Professional, City’s Representative and CONTRACTOR, Design Professional must complete the following:

**DESCRIPTION:** shall include a summary of the Work included in the WCD. Additional information may be attached to the WCD to further define the scope.

**PURPOSE OF WORK CHANGE DIRECTIVE:** will identify clearly if the Work included in the WCD is an addition, deletion, revision, or some combination.

**ATTACHMENTS:** shall identify all attachments included in and made a part of the WCD. Be certain that attachments are clearly labeled.

**METHOD OF DETERMINING CHANGE, IF ANY, IN CONTRACT PRICE:** Mark the method to be used in determining the final cost of Work involved and the estimated net effect on the Contract Price. If the change involves an increase in the Contract Price and the estimated amount is approached before the additional or changed Work is completed, another WCD must be issued to change the estimated price. Do not leave blank spaces or write “To be determined” (or “TBD”). An estimated dollar figure must be assigned to the Work. If the WCD is not likely to change the Contract Price, the space for estimated increase (decrease) should be marked “No Change in Price”.

**METHOD OF DETERMINING CHANGE, IF ANY, IN CONTRACT TIMES:** Mark the method to be used in determining the change in Contract Times and the estimated increase or decrease in Contract Times. If the change involves an increase in the Contract Times and the estimated times are approached before the additional or changed Work is completed, another WCD must be issued to change the times or CONTRACTOR may stop the changed Work when the estimated times are reached. Do not leave blank spaces or write “To be determined” (or “TBD”). If the WCD is not likely to change the Contract Times, the space for estimated increase (decrease) should be marked “No Change in Times”.

Once Design Professional has completed and signed the form, all copies should be sent to CITY for authorization because Design Professional does not have authority to authorize changes in Price or Times. Once authorized by CITY, a copy must be sent by Design Professional to CONTRACTOR. Price and Times may only be changed by Change Order signed by CITY, Design Professional, and CONTRACTOR. If the value of the work included in the WCD exceeds the contingency or budget available for the contract, staff must obtain written approval from the Director or his or her designee before the WCD is issued. A Director or his or her designee may not approve a WCD that will exceed City Council authorization. If the work included in the WCD is needed as a result of an emergency, staff may proceed with the issuance of the WCD without

prior written approval even if the value of the work added is expected to exceed the contract contingency balance.

Once the Work covered by this directive is completed or final cost and times are determined. CONTRACTOR must submit proper documentation for inclusion in a Change Order.

**IF THIS IS A DIRECTIVE TO PROCEED WITH A CHANGE THAT MAY AFFECT THE CONTRACT PRICE OR THE CONTRACT TIMES A CHANGE ORDER, IF ANY, MUST BE PROCESSED PROMPTLY.**

## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work Under Separate Contracts
5. Access to site.
6. Work restrictions.
7. Specification and Drawing conventions.

##### B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

#### 1.2 PROJECT INFORMATION

##### A. Project Identification: Waste Water Treatment Building – Blue River Annex

1. Project Location: 950 N Century, Kansas City, MO 64120.
2. Owner's Contract Number: 1541.
3. Owner's Project Number: 81000812.

##### B. Owner: Water Services Department, City of Kansas City, Missouri,

1. Owner's Address: Engineering, 4800 E. 63<sup>rd</sup> Street, Kansas City, MO 64130
2. Owner's Representative: Craig Daily, [craig.daily@kcmo.org](mailto:craig.daily@kcmo.org).
3. Owner's Representative: Bon Marie Gardner, [bon.marie.gardner@kcmo.org](mailto:bon.marie.gardner@kcmo.org).

#### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

##### A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Provide alterations to existing 59,973 SF warehouse and office building to build maintenance crew offices, restrooms and locker rooms, conference rooms, and storage spaces. The existing pre-engineered metal building was constructed in 1992 and added to in 1994. It was classified under the 1991 *Uniform Building Code* as a B-2 Occupancy. Construction Type is II-B. The building is fully sprinklered.
2. Work includes selective demolition to allow for new work including slab removal and replacement to allow for new plumbing, miscellaneous metals, cold-formed metal

framing and non-structural metal framing for interior walls, hollow metal doors and frames, interior finishes, toilet and shower compartments, lockers, plastic laminate casework, and counter tops. Work also includes new mechanical electrical and plumbing systems and fire protection modifications for the new interior spaces. Work includes electrical service and water service upgrades.

- B. Type of Contract: Project will be constructed under a single prime contract.

#### 1.4 WORK BY OWNER

- A. General: If the Owner elects to perform construction operations concurrent with work under this contract, cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner.

#### 1.5 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner may elect to contract separately for commissioning services. Those operations will be conducted simultaneously with work under this Contract.

#### 1.6 ACCESS TO SITE

- A. Use of Site: Limit use of Project site to Work in areas indicated on drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

#### 1.7 COORDINATION WITH OCCUPANTS

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
  - 1. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

2. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

#### 1.8 WORK RESTRICTIONS

- A. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours indicated in Master Agreement, unless otherwise indicated.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others without a three-day notification.

#### 1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000



## SECTION 012200 - UNIT PRICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

#### 1.2 DEFINITIONS

- A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### 1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. 1: Moisture Vapor Transmission Coating System under 096519 "Resilient Tile Flooring," and 096723 "Resinous Flooring."
  - 1. Description: Apply moisture vapor transmission coating in manufacturer's recommended thickness where testing shows moisture-vapor emissions are not within acceptable levels.
  - 2. Unit of Measurement: Square foot of area covered.

B. Unit Price No. 2: Reinforcing Membrane.

1. Description: Apply reinforcing membrane to cracks in floor slab to the extent determined after shot blasting slab according to Section 096723 "Resinous Flooring."
2. Unit of Measurement: Lineal Foot of area covered.

END OF SECTION 012200

## SECTION 012300 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

#### 1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

#### 1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Provide new 120V motorized damper actuator and interlock with existing ventilation fans as shown on M-2.01, M-3.01 and M-3.05.
- B. Alternate No. 2: Achieve Substantial Completion within 105 days from Notice to Proceed.

END OF SECTION 012300

## SECTION 012500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

#### 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit electronically each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Documentation: Provide all necessary documentation for an evaluation of the proposed substitution including the following:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

- e. Comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - f. Cost information, including a proposal of change, if any, in the Contract Sum.
  - g. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
  - h. Contractor's certification that requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
  - i. Waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 2. If necessary, additional information or documentation will be requested for evaluation within seven days of receipt of a request for substitution.
    - a. Substitution requests may be rejected if sufficient information for evaluation is not provided with the initial substitution request.
  - 3. Notification of acceptance or rejection of proposed substitution will be issued within seven days of receipt of request, or seven days of receipt of additional information or documentation. Use product specified if a decision is not issued within time allocated.

#### 1.4 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

#### 1.5 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 14 days prior to time required for preparation and review of related submittals.
- B. Substitutions for Convenience: Will be considered if received within 21 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Brown & Root.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500



# APPLICATION FOR PAYMENT

**Project/Contract Numbers:** 81000812/1541

**Project Title:** Waste Water Treatment Building - Blue River Annex - Bid #2

Final Payment<sup>5</sup>

CONTRACTOR \_\_\_\_\_

Address \_\_\_\_\_

Application Number<sup>2</sup>: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Ordinance/Resolution Number: \_\_\_\_\_  
 Effective: \_\_\_\_\_  
 PO Number: \_\_\_\_\_  
 Vendor Number: \_\_\_\_\_

Application for Work Accomplished from \_\_\_\_\_ to \_\_\_\_\_

Original Contract Price	[1]		\$	-
Net by Change Orders ___ through ___		[2]	\$	-
Current Contract Price (1+2)		[3]	\$	-
Completed Work	[4]	\$	-	
Disputed Amounts <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]	\$	-	
Total Previous Applications (7+8)		[9]	\$	-
Amount This Application (6-9)		[10]	\$	-
Less Retainage This Application (5%)		[-]	[11]	\$ -
Release of Retainage		[12]	\$	-
Total Due This Application (10-11+12)		[13]	\$	-
Liquidated Damages				
Completion of Work	[14]	\$	-	[-] \$ -
Prevailing Wage <sup>7</sup>	[15]	\$	-	[-] \$ -
MBE/WBE Program <sup>7</sup>	[16]	\$	-	[-] \$ -
Workforce Program <sup>7</sup>	[17]	\$	-	[-] \$ -
<b>Total Amount Due Contractor (13 - 14 through 17)</b>		[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:**

The undersigned CONTRACTOR certifies that (a) all previous progress payments received from OWNER on account of Work done under this Contract have been applied on account to discharge CONTRACTOR's legitimate obligations incurred in connection with Work covered by all prior Applications for Payment; (b) at time of payment, title of all Work, materials and equipment incorporated into said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Lien, security interest or encumbrance); and (c) all Work covered by this Application for Payment is in accordance with the Contract Documents and not defective; and (d) all manufactured goods or commodities used or supplied for this Project are in compliance with Kansas City's Buy America ordinance.

\_\_\_\_\_ By \_\_\_\_\_  
 Contractor Authorized Representative (Print) Signature

Date \_\_\_\_\_

State of \_\_\_\_\_ )  
 )SS  
 County of \_\_\_\_\_ )

Subscribed and Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

My commission expires:

Notary Public:

DESIGN PROFESSIONAL's Recommendation of Payment:

In accordance with the Contract Documents, based on on-Site observations and the data comprising this application, the DESIGN PROFESSIONAL recommends to the OWNER that to the best of the DESIGN PROFESSIONAL's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the CONTRACTOR is entitled to payment of the Amount above listed in this application.

\_\_\_\_\_  
Name of firm (Print)                      DESIGN PROFESSIONAL (Print)                      (Signature)

Date: \_\_\_\_\_

Construction/Program Manager's Recommendation of Payment: (if applicable)

In accordance with the Contract Documents, based on on-Site observations and the data comprising this application, the Construction/Program Manager recommends to the OWNER that to the best of the Construction/Program Manager's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the CONTRACTOR is entitled to payment of the Amount above listed in this application.

\_\_\_\_\_  
Construction/Program Manager firm (Print)                      Authorized Representative (Print)                      (Signature)

Date: \_\_\_\_\_

City's Representative's Agreement with Recommendation of Payment

\_\_\_\_\_  
City's Representative(print)                      (Signature)                      (Date)

City's Approval

The amount previously recommended is approved for payment.

\_\_\_\_\_  
Director or Designee (Print)                      (Signature)                      (Date)

<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

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## SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project/Contract Number: 81000812/1541 Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

From Contractor \_\_\_\_\_ To \_\_\_\_\_ Date \_\_\_\_\_

Spec. No.	Section Title	4	Firm, Address (Check box if Supplier)	Phone, FAX and e-mail	Contact

Attachments:

Signed by: \_\_\_\_\_ Date \_\_\_\_\_

Distribution:  Owner  Contractor  Construction Manager  Design Professional  Consultant  Other



## DAILY LABOR FORCE REPORT

Project/Contract Number: 81000812/1541 Day \_\_\_\_\_ Date \_\_\_\_\_  
 Project Title: Waste Water Treatment Building – Blue River Annex - Bid #2  
 Contractor \_\_\_\_\_  
 Subcontractor \_\_\_\_\_

Weather: (Indicate if weather prevented work and why) \_\_\_\_\_  
 \_\_\_\_\_

Shift: (circle) 5–8 hr Days    4–10 hr Days    Other \_\_\_\_\_

\* This report *MUST be completed and turned in* for EACH DAY until FINAL COMPLETION.

Worker's Full Legal Name	Occupational Title or Classification Group & Skill	Hours Worked & Time (i.e. 10AM – 4PM)	Race & Gender

I CERTIFY THAT ALL OF THE INFORMATION PROVIDED ABOVE IS TRUE AND COMPLETE.  
 Contractor/Subcontractor Representative:

Complete Name: (print) \_\_\_\_\_ Title: (print) \_\_\_\_\_

Signature: \_\_\_\_\_ Page \_\_\_\_ of \_\_\_\_

Distribution:  City Department  Contractor  Subcontractor  Other



## CERTIFICATE OF SUBSTANTIAL COMPLETION

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex  
– Bid #2

CONTRACT FOR: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

DATE OF ISSUANCE: \_\_\_\_\_

PROJECT OR DESIGNATED PORTION SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Design Professional's and/or Construction Manager's best knowledge, information and belief, to be substantially complete. Substantial Completion is the state in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of Project or portion thereof designated above is hereby established as \_\_\_\_\_ which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

\_\_\_\_\_  
CONSTRUCTION MANAGER BY \_\_\_\_\_ DATE \_\_\_\_\_

\_\_\_\_\_  
DESIGN PROFESSIONAL BY \_\_\_\_\_ DATE \_\_\_\_\_

The Contractor will complete or correct the Work on the list of items attached hereto within \_\_\_\_\_ days from the above date of Substantial Completion.

\_\_\_\_\_  
CONSTRUCTION MANAGER BY \_\_\_\_\_ DATE \_\_\_\_\_

\_\_\_\_\_  
DESIGN PROFESSIONAL BY \_\_\_\_\_ DATE \_\_\_\_\_

The Owner accepts the Work or designated portion thereof as substantially complete and will assume full possession thereof at \_\_\_\_\_ (time) on \_\_\_\_\_ (date).

\_\_\_\_\_  
OWNER'S REPRESENTATIVE BY \_\_\_\_\_ DATE \_\_\_\_\_

Distribution:  Owner  
 Contractor  
 Construction Manager  
 Design Professional  
 Consultant  
 Other \_\_\_\_\_



## PUNCH LIST

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

CONTRACTOR \_\_\_\_\_

From \_\_\_\_\_ Site Visit Date \_\_\_\_\_

The following items require the attention of the CONTRACTOR for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the CONTRACTOR to complete all Work in accordance with the Contract Documents.

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

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

DESIGN PROFESSIONAL (Firm/In House)

- Distribution:  OWNER  
 CONTRACTOR  
 DESIGN PROFESSIONAL  
 Consultant \_\_\_\_\_  
 Other \_\_\_\_\_



# CONTRACTOR AFFIDAVIT FOR FINAL PAYMENT

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

STATE OF \_\_\_\_\_ )  
 )SS  
COUNTY OF \_\_\_\_\_ )

The Undersigned, \_\_\_\_\_ of lawful  
(Name)

age, being first duly sworn, states under oath as follows:

1. I am the \_\_\_\_\_ of \_\_\_\_\_ who is the general  
(Title) (CONTRACTOR)  
CONTRACTOR for the CITY on Project No. \_\_\_\_\_ and Project Title \_\_\_\_\_.

2. All payrolls, material bills, use of equipment and other indebtedness connected with the Work for this Project have been paid and all Claims of whatever nature have been satisfied, as required by the Contract.

3. (✓) \_\_\_ Prevailing wage does not apply; or

(✓) \_\_\_ All provisions and requirements set forth in Chapter 290, Section 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works projects have been fully satisfied and there has been no exception to the full and complete compliance with these provisions and requirements and the Annual Wage Order contained in the Contract in carrying out the Contract and Work. CONTRACTOR has fully complied with the requirements of the prevailing wage law as required in the Contract and has attached affidavits from all Subcontractors on this Project, regardless of tier, affirming compliance with the prevailing wage law as stipulated in the Contract.

4. I hereby certify that (a) at project completion and pursuant to contractor's final request for payment, contractor achieved (\_\_\_\_%) Minority Business Enterprise (MBE) participation and (\_\_\_\_%) Women Business Enterprise (WBE) participation on this contract, and (b) listed herein are the names of all certified M/WBE subcontractors, regardless of tier, with whom I, or my subcontractors contracted.

1. Name of MBE/WBE Firm \_\_\_\_\_  
Address \_\_\_\_\_  
\_\_\_\_\_  
Telephone Number (\_\_\_\_\_) \_\_\_\_\_  
IRS Number \_\_\_\_\_  
Area/Scope\*of Work \_\_\_\_\_  
Subcontract Final Amount \_\_\_\_\_

2. Name of MBE/WBE Firm \_\_\_\_\_  
Address \_\_\_\_\_  
\_\_\_\_\_  
Telephone Number (\_\_\_\_\_) \_\_\_\_\_  
IRS Number \_\_\_\_\_  
Area/Scope\*of Work \_\_\_\_\_  
Subcontract Final Amount \_\_\_\_\_

List additional subcontractors, if any, on a similar form and attach to the bid.

Supplier\*\* Final Amount: \_\_\_\_\_

\*Reference to specification sections or bid item number.

- (✓) \_\_\_ Met or exceeded the Contract utilization goals; or
- (✓) \_\_\_ Failed to meet the Contract utilization goals (attach waiver, substitution or modification); or
- (✓) \_\_\_ No goals applied to this Project.

5. CONTRACTOR certifies that each Subcontractor has received full payment for its respective work in connection with the Contract.

6. If applicable, I hereby certify that (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 Signature)

Title \_\_\_\_\_

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, before me  
appeared \_\_\_\_\_, to me personally known to be the  
\_\_\_\_\_ of the \_\_\_\_\_,

and who executed the foregoing instrument and acknowledged that (s)he executed the same on behalf of  
\_\_\_\_\_ as its free act and deed.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year first above written.

My commission expires:

\_\_\_\_\_  
Notary Public





# SUBCONTRACTOR AFFIDAVIT FOR FINAL PAYMENT

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

STATE OF MISSOURI )

) ss:

COUNTY OF \_\_\_\_\_ )

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

1. I am the duly authorized officer of the business indicated below (hereinafter Subcontractor) and I make this affidavit on behalf of Subcontractor in accordance with the requirements set forth in Section 290.290, RSMo. Subcontractor has completed all of the Work required under the terms and conditions of a subcontract as follows:

Subcontract with: \_\_\_\_\_, Contractor

Work Performed: \_\_\_\_\_

Total Dollar Amount of Subcontract and all Change Orders: \$ \_\_\_\_\_

City Certified  MBE  WBE  DBE  NA

List certifications: \_\_\_\_\_

2. Subcontractor fully complied with the provisions and requirements of the Missouri Prevailing Wage Law set forth in Sections 290.210, RSMo through 290.340, RSMo.

**Business Entity Type:**

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

**Subcontractor's Legal Name and Address**

\_\_\_\_\_  
 \_\_\_\_\_  
 Phone No. \_\_\_\_\_  
 Fax: \_\_\_\_\_  
 E:mail: \_\_\_\_\_  
 Federal ID No. \_\_\_\_\_

I hereby certify that I have the authority to execute this affidavit on behalf of Subcontractor.

By: \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date)

**NOTARY**

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

My Commission Expires: \_\_\_\_\_

By \_\_\_\_\_

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. RFIs.
  - 3. Project meetings.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services.
  - 2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

#### 1.2 DEFINITIONS

- A. RFI: Request for Information. Request from Owner seeking information required by or clarifications of the Contract Documents.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
- B. Key Personnel Names: Prepare a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

#### 1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work.

#### 1.5 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. RFIs are to be submitted electronically in PDF format and include information listed below.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  - 1. Project name.
  - 2. Project number.
  - 3. Date.
  - 4. Name of Contractor.
  - 5. RFI number, numbered sequentially.
  - 6. RFI subject.
  - 7. Specification Section number and title and related paragraphs, as appropriate.
  - 8. Drawing number and detail references, as appropriate.
  - 9. Field dimensions and conditions, as appropriate.
  - 10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  - 11. Contractor's signature.
  - 12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. Action: RFI will be reviewed and responded to within five working days. RFIs received after 1:00 p.m. will be considered as received the following working day.
  - 1. Action may include a request for additional information, in which case response time will date from time of receipt of additional information.
  - 2. On receipt and distribution of response, forward notification within five days if Contractor disagrees with response
  - 3. Action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible to submit Change Proposal.

## 1.6 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings may be provided by Architect for Contractor's use during construction.
  - 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
  - 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
  - 3. Each Contractor or subcontractor requesting data files shall complete, sign and return electronic media release form and provide payment for fees stipulated in electronic media release form.
- B. PDF Document Preparation: Where PDFs are required to be submitted, prepare as follows:
  - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  - 2. Name file with submittal number or other unique identifier, including revision identifier.
  - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

## 1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned within five days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction.
  - 1. Attendees: Authorized representatives of Owner, major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Discuss items of significance that could affect progress.
    - a. Responsibilities and personnel assignments.
    - b. Tentative construction schedule.
    - c. Critical work sequencing and long lead items.
    - d. Designation of key personnel and their duties.
    - e. Lines of communications.
    - f. Procedures for processing field decisions and Change Orders.
    - g. Procedures for RFIs.

- h. Procedures for testing and inspecting.
  - i. Procedures for processing Applications for Payment.
  - j. Distribution of the Contract Documents.
  - k. Submittal procedures.
  - l. Preparation of Record Documents.
  - m. Use of the premises and existing building.
  - n. Work restrictions.
  - o. Working hours.
  - p. Owner's occupancy requirements.
  - q. Responsibility for temporary facilities and controls.
  - r. Procedures for moisture and mold control.
  - s. Procedures for disruptions and shutdowns.
  - t. Construction waste management.
  - u. Parking availability.
  - v. Office, work, and storage areas.
  - w. Equipment deliveries and priorities.
  - x. First aid.
  - y. Security.
  - z. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
- 1. 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.
  - 2. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 3. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  - 4. 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.
- D. Progress Meetings: Conduct progress meetings at biweekly intervals.
- 1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority if applicable, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to

construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- b. Review present and future needs of each entity present.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. For administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
1. Startup construction schedule.
  2. Contractor's Construction Schedule.
  3. Construction schedule updating reports.
  4. Daily construction reports.
  5. Material location reports.
  6. Site condition reports.
  7. Unusual event reports.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION (Not Used)

END OF SECTION 013200



## DAILY FIELD OBSERVATION REPORT

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

Contractor \_\_\_\_\_

Report Number \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_

Weather

- Clear     Snow  
 Overcast     Foggy  
 Rain     Cold

- Warm  
 Hot  
 Temperature Range \_\_\_\_\_

Site Conditions

- Clear     Dusty  
 Muddy     \_\_\_\_\_  
 Temperature Range \_\_\_\_\_

Day

- Monday     Thursday  
 Tuesday     Friday  
 Wednesday     \_\_\_\_\_

Persons Contacted:

Work Observed:

Items Discussed:

Materials Delivered:

Requested Revisions or Interpretations:

Nonconforming Work Reported This Date To Contractor:

Remarks:

Attachments

Signed by: \_\_\_\_\_

Date: \_\_\_\_\_

- Distribution:  Owner  
 Contractor  
 Construction Manager  
 Design Professional  
 Consultant \_\_\_\_\_  
 Other \_\_\_\_\_





## PERIODIC FIELD OBSERVATION REPORT

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

Contractor \_\_\_\_\_

Report Number \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_

### Weather

- Clear     Snow  
 Overcast     Foggy  
 Rain     Cold

- Warm  
 Hot  
 Temperature Range \_\_\_\_\_

### Site Conditions

- Clear     Dusty  
 Muddy     \_\_\_\_\_  
 Temperature Range \_\_\_\_\_

### Day

- Monday     Thursday  
 Tuesday     Friday  
 Wednesday     \_\_\_\_\_

Persons Contacted:

Work Observed:

Items Discussed:

Remarks:

Attachments

Signed by: \_\_\_\_\_

Date: \_\_\_\_\_

- Distribution:  Owner  
 Contractor  
 Construction Manager  
 Design Professional  
 Consultant \_\_\_\_\_  
 Other \_\_\_\_\_



## WEEKLY REPORT OF WORKING DAYS

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

Contractor \_\_\_\_\_

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

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

Signed by OWNER'S REPRESENTATIVE \_\_\_\_\_ Date: \_\_\_\_\_

Signed by CONTRACTOR \_\_\_\_\_ Date: \_\_\_\_\_

Distribution:  OWNER  CONTRACTOR  Construction Manager  Design Professional  Consultant  Other

## SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Final completion construction photographs.
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
  - 2. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Digital Photographs: Submit image files within five days of taking photographs.
  - 1. Submit photos electronically.
  - 2. Identification: Provide the following information with each image description.
    - a. Name of Project.
    - b. Date photograph was taken.
    - c. Description of location, vantage point, and direction.

#### 1.3 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera or cell phone.
- B. Digital Images: Submit digital media as originally recorded, without alteration, manipulation, editing, or modifications using image-editing software.
- C. File Names: Name media files with date and description location.

#### 1.4 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.

- B. Preconstruction Photographs: Before commencement of demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
  - 1. Take photographs to show existing conditions adjacent to property before starting the Work.
  - 2. Take photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - 3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- C. Periodic Construction Photographs: Take photographs coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken. Submit the quantity required to adequately describe the status of construction, but not less than 15 views monthly.
- D. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents. Submit the quantity required to adequately describe the project, but not less than 40 photographs.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

## SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for submittals.
- B. Related Requirements:
  - 1. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
  - 2. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
  - 3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

#### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Reviewer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Reviewer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

#### 1.3 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
  - 1. Project name.
  - 2. Date.
  - 3. Name of Contractor.
  - 4. Name of firm or entity that prepared submittal.
  - 5. Names of subcontractor, manufacturer, and supplier.
  - 6. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
  - 7. Category and type of submittal.
  - 8. Submittal purpose and description.
  - 9. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
  - 10. Drawing number and detail references, as appropriate.

11. Indication of full or partial submittal.
12. Location(s) where product is to be installed, as appropriate.
13. Other necessary identification.
14. Remarks.
15. Signature of transmitter.

B. Options: Identify options requiring selection.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

#### 1.4 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit by sending via email. Include PDF transmittal form. Include information in email subject line identifying project and submittal number.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow ten working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Contractor will be advised when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow seven working days for review of each resubmittal.

4. Sequential Review: Where sequential review of submittals by Consultants, Owner, or other parties is indicated, allow fifteen working days for initial review of each submittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation.

## 1.5 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
  4. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
  5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
  6. Samples for Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Samples will be return submittal with options selected.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.



- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
  - 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
  - 2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
  - 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
  - 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
  - 5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
  - 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
  - 1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
  - 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
  - 3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
  - 4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
  - 5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.

#### 1.6 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and two paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

#### 1.7 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp.
- B. Action Submittals: Contractor will review each submittal, indicate corrections or revisions required.
- C. Contractor's Approval: Indicate Contractor's approval for each submittal. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents will be returned without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300



# TRANSMITTAL LETTER

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

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TO: \_\_\_\_\_ Date \_\_\_\_\_  
 \_\_\_\_\_ Re: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 ATTN: \_\_\_\_\_

---

- We are sending you  Attached  Under separate cover via \_\_\_\_\_ the following items:  
 Shop Drawings  Prints  Drawings  Samples  Specifications  
 Copy of Letter  Change Order  \_\_\_\_\_

Copies	Date	No.	Description

- These are transmitted as checked below:
- For Approval  Approved as Submitted  Resubmit \_\_\_\_\_ Copies for Approval  
 For Your Use  Approved as Noted  Submit \_\_\_\_\_ Copies for Distribution  
 As Requested  Returned for Corrections  Return \_\_\_\_\_ Corrected Prints  
 For Review and Comment  \_\_\_\_\_

Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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

- Distribution:  Owner  
 Contractor  
 Construction Manager  
 Design Professional  
 Consultant  
 Other

## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
  - 4. Specific test and inspection requirements are not specified in this Section.

#### 1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of three previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to

NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

- F. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Owner.

### 1.3 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner.

### 1.4 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Owner for direction before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Owner for a decision before proceeding.

### 1.5 ACTION SUBMITTALS

- A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or

certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Reports: Prepare and submit certified written reports and documents as specified.
- C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

#### 1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, telephone number, and email address of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, telephone number, and email address of technical representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Statement that products at Project site comply with requirements.
  - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.

## 1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation



of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- H. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

## 1.9 QUALITY CONTROL

- A. **Owner Responsibilities:** Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
  - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. **Contractor Responsibilities:** Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
  - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  - 2. Engage a qualified testing agency to perform quality-control services.
  - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. **Testing Agency Responsibilities:** Cooperate with Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

#### 1.2 USE CHARGES

- A. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- B. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

### PART 2 - PRODUCTS

#### 2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

#### 2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 SUPPORT FACILITIES INSTALLATION

- A. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- C. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

### 3.3 TEMPORARY UTILITY INSTALLATION

- A. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction of type, number, location, operation and maintenance of fixtures and facilities.
- B. Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperature or high humidity.
- C. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent

properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Site Enclosure Fence: Maintain existing site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates. Lock entrances at end of each workday.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
- H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration from area of work to area where no work is occurring.
- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
  - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

### 3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
  - 2. Indicate methods to be used to avoid trapping water in finished work.

### 3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Maintenance: Maintain facilities in good operating condition until removal.
- B. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been

delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

END OF SECTION 015000

## SECTION 016000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 012500 "Substitution Procedures" for requests for substitutions.

#### 1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

### 1.3 ACTION SUBMITTALS

- A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Action: If necessary, additional information or documentation will be requested for evaluation within seven days of receipt of a comparable product request.
    - a. Use product specified if decision on use of a comparable product request is not made within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

### 1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
  - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
  - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
    - a. Name of product and manufacturer.
    - b. Model and serial number.
    - c. Capacity.
    - d. Speed.
    - e. Ratings.
  - 3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.



B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
3. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

## 1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  4. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  5. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
    - a. Submit additional documentation in order to establish equivalency of proposed products.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    - a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: ..."
  2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    - a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: ..."
  3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: ..."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
    - a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: ..."
  5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: ..."
  6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
    - a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: ..."
  7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
    - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require "match sample," provide a product that complies with requirements and matches sample.
  1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's full range" or similar phrase, select a product that complies with requirements. Owner's representative will select color, gloss, pattern, density, or texture from manufacturer's standard product line unless premium line has been indicated.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Consideration will be made of Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, request will be returned without action, except to record noncompliance with these requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
  2. Evidence that proposed product provides specified warranty.
  3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  4. Samples, if requested.
- B. Submittal Requirements: Approval of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000



## SUBSTITUTION REQUEST

Project/Contract Number: 81000812/1541

Project Title: Waste Water Treatment Building – Blue River Annex – Bid #2

To: \_\_\_\_\_ Authorization Number: \_\_\_\_\_  
From: \_\_\_\_\_  
Re: \_\_\_\_\_ Date: \_\_\_\_\_  
Contract For: \_\_\_\_\_

Specification Title: \_\_\_\_\_  
Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone No. \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Model No. \_\_\_\_\_  
Installer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone No. \_\_\_\_\_  
History:  New Product  2-5 years old  5-10 years old  More than 10 years old  
Differences between proposed substitution and specified product: \_\_\_\_\_

Point-by-point comparative data attached – REQUIRED

### Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance, service, and availability of replacement parts, as applicable, are available.
- Proposed substitution will not affect or delay Progress Schedule, except as stated below.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances, except as stated below.
- Payment will be made for changes to building design, including architectural or engineering design, detailing, licenses, royalties, and construction costs caused by the requested substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be completed in all respects.

Reason for not providing specified item: \_\_\_\_\_

### Similar Installation:

Project: \_\_\_\_\_ Design Professional: \_\_\_\_\_  
Address: \_\_\_\_\_ Owner: \_\_\_\_\_  
Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work:  No  Yes; explain \_\_\_\_\_

Savings to Owner for accepting substitution: \_\_\_\_\_  
Proposed substitution changes Contract Time:  No  Yes; add/deduct \_\_\_\_\_ days.

Supporting Data Attached:

Product Data  Drawings  Tests  Reports  Samples  \_\_\_\_\_

Attachments: \_\_\_\_\_

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Submitted by: \_\_\_\_\_

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

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-Mail: \_\_\_\_\_

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Additional Comments:  Contractor  Subcontractor  Supplier  Manufacturer  DP  \_\_\_\_\_

**DESIGN PROFESSIONAL'S REVIEW AND ACTION**

- Substitution approved – Make submittals in accordance with Specification Section 01300.
- Substitution approved as noted – Make submittals in accordance with Specification Section 01300.
- Substitution rejected – Use specified materials.
- Substitution Request received too late – Use specified materials.

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

- 
- Distribution:
- Owner
  - Design Professional
  - Contractor
  - Consultant
  - Construction Manager
  - Other

## SECTION 017300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting surveys.
  - 2. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

#### 1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

#### 1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
  - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in

- reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.



3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information according to requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks.
- B. Site Improvements: Locate and lay out site improvements including ramps and utility slopes.

### 3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  1. Make vertical work plumb and make horizontal work level.
  2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights to comply with accessibility requirements.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.

### 3.5 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extending one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
  - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.7 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

### 3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Disposing of nonhazardous demolition and construction waste.

#### 1.2 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### 1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

END OF SECTION 017419

## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
  - 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

#### 1.2 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at final completion.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Certified Payrolls: Timely and accurate indicating final completion.

#### 1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of five days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.



1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number.
  5. Submit testing, adjusting, and balancing records.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of five days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
  6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  7. Terminate and remove temporary facilities from Project site.
  8. Complete final cleaning requirements.
  9. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of five days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will notify Contractor of items, either on Contractor's list or additional items identified, that must be completed or corrected.
1. Request reinspection when work identified is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for final completion.

## 1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Certified List of Incomplete Items: Submit copy of inspection list of items to be completed or corrected (punch list), indicating each item has been completed or otherwise resolved for acceptance.
  2. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of five days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements.
  - 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of 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 that are outside the limits of construction.
  - 1. Organize list of spaces in sequential order.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

#### 1.7 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Warranties in Paper Form:
  - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) 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.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. 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.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform 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 manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - d. Remove snow and ice to provide safe access to building.
    - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - g. Sweep concrete floors broom clean.
    - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - j. Remove labels that are not permanent.
    - k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

- l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
  - o. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
  - p. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 017700

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Systems and equipment operation and maintenance manuals.
  - 2. Product maintenance manuals.

#### 1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
- B. Format: Submit operation and maintenance manuals in the following format:
  - 1. Submit on digital media acceptable to Owner or by email. Enable reviewer comments on draft submittals.
  - 2. Submit two paper copies.
- C. Submit each manual in final form prior to requesting inspection for Substantial Completion and at least five days before commencing demonstration and training.
- D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

#### 1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 1.5 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.

3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Commissioning Authority.
  7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 1.6 SYSTEMS AND EQUIPMENT OPERATIONS AND MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed. Identify color-coding where required for identification.
- G. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- H. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- I. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.



- 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- J. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- K. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
- L. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

#### 1.7 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

## SECTION 017839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Submittals.
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures" for general closeout procedures.
  - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.2 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Orders.
    - k. Changes made in response to RFIs or Supplemental Instructions.

- l. Details not on the original Contract Drawings.
  - m. Field records for variable and concealed conditions.
  - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings neatly, completely and accurately.
  4. Mark important additional information that was either shown schematically or omitted from original Drawings.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Contractor.

### 1.3 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
- B. Format: Submit record Specifications as paper copy.

### 1.4 RECORD SUBMITTALS

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
- C. Format: Submit record Product Data as annotated PDF electronic file.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839

## SECTION 017900 - DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.

#### 1.2 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved.

#### 1.3 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. For each module, include instruction for the following as applicable to the system, equipment, or component:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.

- b. Systems and equipment operation manuals.
  - c. Systems and equipment maintenance manuals.
  - d. Product maintenance manuals.
  - e. Project Record Documents.
  - f. Identification systems.
  - g. Warranties and bonds.
  - h. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning.

- e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

#### 1.4 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

END OF SECTION 017900



## SECTION 024119 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes demolition and removal of selected portions of building and site elements.

#### 1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

#### 1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 2. Coordination for shutoff, capping, and continuation of utility services.
  - 3. Coordination of Owner's continuing occupancy of portions of existing building.
- B. Predemolition Photographs: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before Work begins.

#### 1.5 FIELD CONDITIONS

- A. Owner may occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove storage racks in area of work.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.6 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine existing conditions. Notify Owner of discrepancies between existing conditions and drawings before proceeding with selective demolition.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
  - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
  - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
  - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

### 3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  1. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
- B. Remove temporary barricades and protections where hazards no longer exist.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  5. Maintain fire watch during and for at least one hour after flame-cutting operations.
  6. Maintain adequate ventilation when using cutting torches.
  7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  10. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.
  5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- 3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS
- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

### 3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.

### 3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

## SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.

#### 1.3 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.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE, GENERAL

- A. Comply with the following sections of **ACI 301 (ACI 301M)** unless modified by requirements in the Contract Documents:
  - 1. "General Requirements."
  - 2. "Formwork and Formwork Accessories."
  - 3. "Reinforcement and Reinforcement Supports."
  - 4. "Concrete Mixtures."
  - 5. "Handling, Placing, and Constructing."
- B. Comply with **ACI 117 (ACI 117M)**.

#### 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, **Grade 60 (Grade 420)**, deformed.
- B. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

- D. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

## 2.3 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
  - 1. Portland Cement: ASTM C 150/C 150M, Type I/II.
  - 2. Fly Ash: ASTM C 618, Class C or F.
  - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
- C. Normal-Weight Aggregate: ASTM C 33/C 33M, 1-1/2-inch (38-mm) nominal maximum aggregate size.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Water: ASTM C 94/C 94M.

## 2.4 RELATED MATERIALS

- A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A.
- B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

## 2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

## 2.6 CONCRETE MIXTURES

- A. Comply with **ACI 301 (ACI 301M)**.
- B. Normal-Weight Concrete:
  - 1. Minimum Compressive Strength: **4000 psi (27.6 MPa)** at 28 days.
  - 2. Maximum W/C Ratio: 0.45.
  - 3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
  - 4. Slump Limit: **4 inches (100 mm)**, plus or minus **1 inch (25 mm)**.
  - 5. Air Content: Maintain within range permitted by **ACI 301 (ACI 301M)**. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

## 2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
  - 1. When air temperature is above **90 deg F (32 deg C)**, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For mixer capacity of **1 cu. yd. (0.76 cu. m)** or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For mixer capacity larger than **1 cu. yd. (0.76 cu. m)**, increase mixing time by 15 seconds for each additional **1 cu. yd. (0.76 cu. m)**.
  - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

## PART 3 - EXECUTION

### 3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to **ACI 301 (ACI 301M)**.



### 3.2 VAPOR-RETARDER INSTALLATION

- A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.
  - 1. Lap joints **6 inches (150 mm)** and seal with manufacturer's recommended adhesive or joint tape.

### 3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

### 3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of **1/8 inch (3.2 mm)**. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
  - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut **1/8-inch- (3.2-mm-)** wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

### 3.5 CONCRETE PLACEMENT

- A. Comply with **ACI 301 (ACI 301M)** for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of **ACI 301 (ACI 301M)**.

- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment according to **ACI 301 (ACI 301M)**.
- E. Equipment Bases and Foundations:
  - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  - 2. Construct concrete bases **4 inches (100 mm)** high unless otherwise indicated; and extend base not less than **6 inches (150 mm)** in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
  - 3. Minimum Compressive Strength: **4000 psi (27.6 MPa)** at 28 days.
  - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **18-inch (450-mm)** centers around the full perimeter of concrete base.
  - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor them into structural concrete substrate.
  - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

### 3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish for Surfaces not Exposed to View: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding **1/2 inch (13 mm)**.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding **1/8 inch (3 mm)**.
  - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following rubbed finish, defined in **ACI 301 (ACI 301M)**, to smooth-formed-finished as-cast concrete where indicated:
  - 1. Smooth-rubbed finish.
  - 2. Grout-cleaned finish.
  - 3. Cork-floated finish.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.7 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
  - 1. Do not further disturb surfaces before starting finishing operations.
- C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes unless otherwise indicated.
- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Slip-Resistive Broom Finish: Apply a slip-resistive finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

### 3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with [ACI 305.1 \(ACI 305.1M\)](#) for hot-weather protection during curing.
- B. 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.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
  - a. Water.
  - b. Continuous water-fog spray.
  - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301 (ACI 301M).
  1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
  2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

END OF SECTION 033053

## SECTION 054000 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes engineering and installation of cold-formed metal framing to provide interior “buildings within an existing building.” Framing elements include:
  - 1. Load-bearing wall framing.
  - 2. Exterior non-load-bearing wall framing.
  - 3. Floor joist framing.
  - 4. Ceiling joist framing.
- B. Section also includes engineering and cold-formed metal framing to provide lateral bracing for Folding Panel Partition, Section 102239.
- C. Related Requirements:
  - 1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, and connections used with cold-formed metal framing.
  - 2. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing metal-stud framing within height limitations, and ceiling-suspension assemblies.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
  - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel framing and bracing.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads:
    - a. Ceiling Load/Roof Live Load: 20 PSF
    - b. Floor Load (where shown on Framing Plan): 50 PSF (Uniform), See Framing Plan for Concentrated Load
  2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft. (239 Pa).
    - b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.
    - c. Floor Joist Framing: Vertical deflection of 1/360 for live loads and 1/240 for total loads of the span.
    - d. Ceiling Joist Framing: Vertical deflection of 1/180 for the span for live loads and 1/240 for total loads of the span.
  3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
  4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
    - a. Upward and downward movement of 1/2 inch (13 mm).
  5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
1. Floor and Roof Systems: AISI S210.
  2. Wall Studs: AISI S211.
  3. Headers: AISI S212.
  4. Lateral Design: AISI S213.

## 2.2 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
1. Grade: As required by structural performance.
  2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZM150), or GF30 (ZGF90).

### 2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges.
- D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated.

### 2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges.
- C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

### 2.5 INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
- B. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

### 2.6 FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths required for spans, unpunched, with stiffened flanges.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges.

## 2.7 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths required for span, unpunched, with stiffened flanges.

## 2.8 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  - 1. Supplementary framing.
  - 2. Bracing, bridging, and solid blocking.
  - 3. Web stiffeners.
  - 4. Anchor clips.
  - 5. End clips.
  - 6. Stud kickers and knee braces.
  - 7. Joist hangers and end closures.
  - 8. Hole-reinforcing plates.
  - 9. Backer plates.

## 2.9 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by mechanically deposition according to ASTM B 695, Class 50.
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.
- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

## 2.10 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780/A 780M, MIL-P-21035B, or SSPC-Paint 20.



- B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.
- C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, **1/4 inch (6 mm)** thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

## 2.11 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of **1/8 inch in 10 feet (1:960)** and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus **1/8 inch (3 mm)** from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of **1/8 inch (3 mm)**.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than **1/4 inch (6 mm)** to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding **1/16 inch (1.6 mm)**.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

### 3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
  - 1. Anchor Spacing: As shown on Shop Drawings.
- B. Squarely seat studs against top and bottom tracks, with gap not exceeding **1/8 inch (3 mm)** between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm).
  - C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
  - D. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
  - E. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
    1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
    2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
  - F. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
    1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
  - G. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.
    1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.
    2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
  - H. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.
- 3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION
- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
  - B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
    1. Stud Spacing: 16 inches (406 mm).

- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than **48 inches (1220 mm)** apart. Fasten at each stud intersection.
  - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- F. Install miscellaneous framing and connections, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.6 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
  - 1. Install joists over supporting frame with a minimum end bearing of **1-1/2 inches (38 mm)**.
  - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.
- C. Space joists not more than **2 inches (51 mm)** from abutting walls, and as follows:
  - 1. Joist Spacing: As indicated on Shop Drawings.
- D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.
- E. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
  - 1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
  - 2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- F. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

- G. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

### 3.7 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of **1/8 inch in 10 feet (1:960)** and as follows:
  - 1. Space individual framing members no more than plus or minus **1/8 inch (3 mm)** from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.8 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

## SECTION 055000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal bollards.

#### 1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 1.3 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

#### 1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.5 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
  - 2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 (Z275) coating; 0.064-inch (1.6-mm) nominal thickness.
  - 3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0528-inch (1.35-mm) minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

### 2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 or Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
  - 3. Provide stainless-steel fasteners for fastening nickel silver.
  - 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- G. Post-Installed Anchors: Chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) or Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

### 2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099123 Interior Painting."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).



## 2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

## 2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel members of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Fabricate steel pipe columns for supporting construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
  - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
  - 2. Unless otherwise indicated, provide 1/2-inch (12.7-mm) baseplates with four 5/8-inch (16-mm) anchor bolts and 1/4-inch (6.4-mm) top plates.
- E. Galvanize miscellaneous framing and supports where indicated.
- F. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

## 2.6 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime miscellaneous steel trim.

## 2.7 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch (19-mm) anchor bolts.
- C. Prime bollards with zinc-rich primer.

## 2.8 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.9 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with primers specified in Section 099123 "Painting" unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

- C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions and overhead doors securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

### 3.3 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each bollard unless otherwise indicated.
1. Embed anchor bolts at least 4 inches (100 mm) in concrete.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

## SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes wood blocking and nailers, and plywood backing panels.

#### 1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.

- B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal (38-mm actual) thickness or less; no limit for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

## 2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  - 1. Treatment shall not promote corrosion of metal fasteners.
  - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all miscellaneous carpentry unless otherwise indicated.

## 2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including blocking and nailers.
- B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

## 2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

## 2.6 METAL FRAMING ANCHORS

- A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
  - 1. Use for wood-preservative-treated lumber and where indicated.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood panels by fastening to studs or joists; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.



- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
  - 2. ICC-ES evaluation report for fastener.
- I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

END OF SECTION 061053

## SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

##### B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 123623.13 "Plastic-Laminate-Clad Countertops."

#### 1.2 COORDINATION

- ##### A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

#### 1.3 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.

##### B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

- ##### C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or fabricator's standard size.

#### 1.4 QUALITY ASSURANCE

- ##### A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

- B. Installer Qualifications: Fabricator of products, AWI's Quality Certification Program accredited participant, or WI's Certified Compliance Program licensee.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until HVAC system in area of work is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

### PART 2 - PRODUCTS

#### 2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. The Contract Documents may contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Grade: Custom.
- C. Type of Construction: Face frame.
- D. Door and Drawer-Front Style: Reveal overlay.
  - 1. Reveal Dimension: **1/2 inch (13 mm)**.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

- F. Laminate Cladding for Exposed Surfaces:
  - 1. Horizontal Surfaces: Grade HGS.
  - 2. Vertical Surfaces: Grade HGS.
  - 3. Edges: ABS edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
  - 4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Materials for Semiexposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
    - a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
    - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
  - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
  - 3. Drawer Bottoms: Thermoset decorative panels.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
  - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as selected from manufacturer's standard color and finish range.

## 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
  - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
  - 2. Particleboard: ANSI A208.1, Grade M-2.
  - 3. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

## 2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets. All hardware is to be Grade 1.
- B. Butt Hinges: 2-3/4-inch (70-mm), five-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal.
- C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- D. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip
- E. Drawer Slides: BHMA A156.9.
  - 1. Grade 1: Side mounted and extending under bottom edge of drawer for drawers more than 3 inches (75 mm) high, but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide.
  - 2. Grade 1HD-100: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides for drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide.
- F. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- G. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

## 2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

### 3.2 INSTALLATION

- A. Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of **1/8 inch in 96 inches (3 mm in 2400 mm)** using concealed shims.
  - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
  - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than **16 inches (400 mm)** o.c. with No. 10 wafer-head screws sized for not less than **1-1/2-inch (38-mm)** penetration into wood framing, blocking, or hanging strips; or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

### 3.4 CASEWORK SCHEDULE

- A. Refer to casework designations on plans for size and quantities of cabinets described below. Provide blocking in walls for installation of base and wall cabinets. Provide filler pieces where cabinets meet walls for continuous installation with not gaps.

- B. Base Cabinets: 23-inch deep (unless otherwise noted below) by +/-33-inch high to allow for counter height not to exceed 24" deep by 34" high. Units to have 4" high toe space.
1. B1: Base unit with pair of doors below pair of drawers. Drawers to align with sink base apron. Unit to have one adjustable shelf.
  2. B2: Sink base with pair of doors below apron.
  3. B3: Four-drawer base unit with top drawer aligning with sink base apron.
- C. Wall Cabinets: 12-inch deep by 24-inch high wall-mounted with one adjustable shelf. Mount wall cabinets 18 inches above countertop.
1. W1: Wall unit with pair of doors.
  2. W2: Wall unit with single door.

END OF SECTION 064116

## SECTION 066400 - PLASTIC PANELING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes plastic sheet paneling. As an alternate, factory-laminated plastic sheet paneling may be utilized.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

#### 1.3 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

#### 2.2 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319.
  - 1. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 450 or less.
  - 2. Nominal Thickness: Not less than 0.09 inch (2.3 mm).
  - 3. Surface Finish: Molded pebble texture.
  - 4. Color: As selected from manufacturer's full range.



## 2.3 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
  - 1. Color: As selected from manufacturer's full range.
- B. Corner Guards:
  - 1. PVC Corner Guards: Manufacturer's standard PVC corner guards at all outside corners, unless otherwise indicated to receive stainless steel corner guards.
    - a. Color: As selected from manufacturer's full range.
  - 2. Stainless Steel Corner Guards: Manufacturer's standard stainless steel corner guard with #4 brushed satin finish at the following locations.
    - a. Mens Locker 114, and Womens Locker 116.
- C. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- D. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- E. Adhesive: As recommended by plastic paneling manufacturer.
- F. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- B. Lay out paneling before installing. Locate panel joints so that trimmed panels at corners are not less than **12 inches (300 mm)** wide.
  - 1. Mark plumb lines on substrate at trim accessory locations for accurate installation.

2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

### 3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install factory-laminated panels using concealed mounting splines in panel joints.
- D. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.
- E. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 066400

## SECTION 072100 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Glass-fiber blanket.
3. Mineral-wool blanket.

##### B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for z-furring channels.
2. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of product.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

##### A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

##### B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

### PART 2 - PRODUCTS

#### 2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

##### A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

- B. Extruded Polystyrene Board, Type X for use with Z-furring: ASTM C 578, Type X, 15-psi (104-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
- C. Extruded Polystyrene Board, Type V for use below slab infill: ASTM C 578, Type V, 100-psi (690-kPa) minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

## 2.2 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced for use in metal-framed walls and above ceiling/roof: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- B. Glass-Fiber Blanket, Polypropylene-Scrim-Kraft Faced for use in replacing damaged or missing insulation on pre-engineered metal building walls or roof: ASTM C 665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

## 2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
  - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
  - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain **3-inch (76-mm)** clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed **96 inches (2438 mm)**, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately **2.5 lb/cu. ft. (40 kg/cu. m)**.

### 3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

## SECTION 079200 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Nonstaining silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Butyl joint sealants.
5. Latex joint sealants.

##### B. Related Requirements:

1. Section 096723 "Resinous Flooring" for sealing and filling construction joints in slabs where resinous flooring is scheduled.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each joint-sealant product.

##### B. Samples for Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

##### C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application and joint location.
2. Joint-sealant manufacturer and product name.

#### 1.3 FIELD CONDITIONS

##### A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected from manufacturer's full range.

### 2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

### 2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
- B. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 50, Uses T and NT.

### 2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

### 2.5 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

### 2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP (opaque with color) and Type C (clear), Grade NF.

## 2.7 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and



- approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form

smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

### 3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
  1. Joint Locations:
    - a. Isolation and contraction joints in cast-in-place concrete slabs.
    - b. Other joints as indicated on Drawings.
  2. Joint Sealant: Urethane, M, P, 50, T, NT.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  1. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Joints between metal panels.
    - c. Joints between different materials listed above.
    - d. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    - e. Other joints as indicated on Drawings.
  2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
  3. Joint-Sealant Color: As selected from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Other joints as indicated on Drawings.
  2. Joint Sealant: Urethane, S, P, 25, T, NT.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    - c. Joints between plastic laminate countertops and walls, and between countertops and applied backsplashes.
    - d. Other joints as indicated on Drawings.
  2. Joint Sealant: Acrylic latex.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Other joints as indicated on Drawings.
  2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
- F. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
    - a. Aluminum thresholds.
    - b. Sill plates.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Butyl-rubber based.

END OF SECTION 079200

## SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes interior and exterior steel doors and frames.
- B. Related Requirements:
  - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.2 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door type.
  - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, joints, field splices, and connections.
  - 7. Details of accessories.
  - 8. Details of moldings, removable stops, and glazing.
- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum **4-inch- (102-mm-)** high wood blocking. Provide minimum **1/4-inch (6-mm)** space between each stacked door to permit air circulation.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

#### 2.2 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Standard-Duty Doors and Frames: SDI A250.8, Level 1; SDI A250.4, Level C, all interior doors.
  - 1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: **1-3/4 inches (44.5 mm)**.
    - c. Face: Uncoated steel sheet, minimum thickness of **0.032 inch (0.8 mm)**.
    - d. Edge Construction: Model 1, Full Flush.
    - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
    - f. Core: Manufacturer's standard.
    - g. Core: Insulated interior doors: Polyurethane or Polyisocyanurate.
    - h. Fire-Rated Core: Manufacturer's standard vertical steel stiffener or laminated mineral board core for fire-rated doors.

2. Frames:
  - a. Materials: Uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
  - b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
  - c. Construction: Face welded.
3. Exposed Finish: Prime.

### 2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B at exterior locations.

1. Doors:
  - a. Type: As indicated in the Door and Frame Schedule.
  - b. Thickness: 1-3/4 inches (44.5 mm).
  - c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum A40 (ZF120) coating.
  - d. Edge Construction: Model 1, Full Flush.
  - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
  - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
  - g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
  - h. Core: Polyurethane or Polyisocyanurate.
2. Frames:
  - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
  - b. Construction: Face welded.
3. Exposed Finish: Prime.

### 2.4 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
- B. Construction: Face welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

## 2.5 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

## 2.6 FRAME ANCHORS

- A. Jamb Anchors:
  1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each **24 inches (610 mm)** of frame height above **7 feet (2.1 m)**.
  3. Postinstalled Expansion Anchor: Minimum **3/8-inch- (9.5-mm-)** diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

## 2.7 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- E. Glazing: Comply with requirements in Section 088000 "Glazing."

## 2.8 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
  2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
  - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
  1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
  2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
  4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

## 2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.



### 3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    - a. Install frames with removable stops located on secure side of opening.
  - 2. Floor Anchors: Secure with postinstalled expansion anchors.
  - 3. Fire-Rated Openings: Install frames according to NFPA 80.
  - 4. Solidly pack mineral-fiber insulation inside frames at door to Air Compressor Room.
  - 5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    - a. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

### 3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

## SECTION 083113 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

#### 1.2 ALLOWANCES

- A. Access doors and frames are part of an access door and frame allowance.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Schedule: For access doors and frames.

### PART 2 - PRODUCTS

#### 2.1 ACCESS DOORS AND FRAMES

- A. Exterior Flush Access Doors:
  - 1. Basis-of-Design: Babcock-Davis ; Exterior Access Door (BXTA).
  - 2. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and minimum **R-11** insulation.
  - 3. Locations: Wall and ceiling at locations indicated on drawings.
  - 4. Door Size: 24 inches by 24 inches.
  - 5. Metallic-Coated Steel Sheet for Door: minimum 24 gauge, factory finished.
  - 6. Frame Material: 0.080 inch thick 6063-T5 extruded aluminum, mill finish.
  - 7. Hinge: Stainless steel continuous piano hinge.
  - 8. Latch and Lock: Cam latch operated by handle.

#### 2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 304 or Type 316. Remove tool and die marks and stretch lines, or blend into finish.
- E. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063.
- F. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- G. Frame Anchors: Same material as door face.
- H. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

### 2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latch and Lock Hardware:
  - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
  - 2. Keys: Furnish two keys per lock and key all locks alike.
  - 3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."
- E. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

### 2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.

- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
  2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of **1 mil (0.025 mm)** for topcoat.
    - a. Color: As selected from manufacturer's full range.
- E. Stainless Steel Finishes:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
  2. Polished Finish: ASTM A480/A480M No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.
    - a. Run grain of directional finishes with long dimension of each piece.
    - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  3. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

### 3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

## SECTION 087100 – DOOR HARDWARE

### 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. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical door hardware.
  - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section “Hollow Metal Doors and Frames”.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series
  - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

#### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    - b. Complete (risers, point-to-point) access control system block wiring diagrams.
    - c. Wiring instructions for each electronic component scheduled herein.
  2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format.

Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

#### 1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

E. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  3. Review sequence of operation narratives for each unique access controlled opening.
  4. Review and finalize construction schedule and verify availability of materials.
  5. Review the required inspecting, testing, commissioning, and demonstration procedures
- G. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.
- D. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- E. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.



- F. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

## 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Special Warranty Periods:
  - 1. Ten years for mortise locks and latches.
  - 2. Seven years for heavy duty cylindrical (bored) locks and latches.
  - 3. Five years for exit hardware.
  - 4. Twenty five years for manual surface door closer bodies.
  - 5. Two years for electromechanical door hardware.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.
- D. Source Limitations: Obtain each type of door hardware from single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
1. Air Leakage Rate: Maximum air leakage of **0.3 cfm/sq. ft. (3 cu. m per minute/sq. m)** at the tested pressure differential of **0.3-inch wg (75 Pa)** of water.
- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Means of Egress Doors: Latches do not require more than **15 lbf (67 N)** to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than **5 lbf (22.2 N)**.
  2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: **5 lbf (22.2 N)** applied perpendicular to door.
    - b. Sliding or Folding Doors: **5 lbf (22.2 N)** applied parallel to door at latch.
    - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than **1/2 inch (13 mm)** high.
  4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.

5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

## 2.3 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
  - a. Two Hinges: For doors with heights up to 60 inches.
  - b. Three Hinges: For doors with heights 61 to 90 inches.
  - c. Four Hinges: For doors with heights 91 to 120 inches, and for dutch doors.
  - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
  - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
  - b. Sizes from 3'7" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
  - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
  - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
  - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
  - a. Bommer Industries (BO).
  - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
  - c. Stanley Hardware (ST).

- B. Pivots: ANSI/BHMA A156.4, Grade 1, certified. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

1. Manufacturers:
  - a. Architectural Builders Hardware (AH).
  - b. Rixson Door Controls (RF).

## 2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
  2. Furnish dust proof strikes for bottom bolts.
  3. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
  4. Manufacturers:
    - a. Door Controls International (DC).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).
- B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
1. Manufacturers:
    - a. Door Controls International (DC).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).
- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
  2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
  3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
  4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
  5. Manufacturers:
    - a. Hiawatha, Inc. (HI).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).

## 2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
- C. Keying System: Each type of lock and cylinders to be factory keyed.
1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  3. Existing System: Key locks to Owner's existing system.
- D. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
  2. Master Keys (per Master Key Level/Group): Five (5).
  3. Construction Keys (where required): Ten (10).
- E. Construction Keying: Provide construction master keyed cylinders.
- F. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
  2. Provide transcript list in writing or electronic file as directed by the Owner.
- G. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
    - a. Lund Equipment (LU).
    - b. MMF Industries (MM).
    - c. Telkee (TK).
- H. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into "Key Wizard" software.
- 2.6 MECHANICAL LOCKS AND LATCHING DEVICES
- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Manufacturers:

- a. Corbin Russwin Hardware (RU) – ML2000 Series.
  - b. Sargent Manufacturing (SA) – 8200 Series.
  - c. Yale Locks and Hardware (YA) – 8800FL Series.
- B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
  2. Locks are to be non-handed and fully field reversible.
  3. Manufacturers:
    - a. Corbin Russwin Hardware (RU) – CL3300 Series.
    - b. Sargent Manufacturing (SA) – 10 Line.
    - c. Yale Locks and Hardware (YA) 5400LN Series.

## 2.7 AUXILIARY LOCKS

- A. Narrow Case Deadlocks and Deadlatches: ANSI/BHMA 156.13 Series 1000 Grade 1 certified narrow case deadlocks and deadlatches for swinging or sliding door applications. All functions shall be manufactured in a single sized case formed from 12 gauge minimum, corrosion resistant steel (option for fully stainless steel case and components). Provide minimum 2 7/8" throw laminated stainless steel bolt. Bottom rail deadlocks to have 3/8" diameter bolts.
1. Manufacturers:
    - a. Adams Rite Manufacturing (AD) - MS1850S / MS1950 Series.

## 2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  2. Strikes for Bored Locks and Latches: BHMA A156.2.
  3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
  4. Dustproof Strikes: BHMA A156.16.

## 2.9 ELECTRIC STRIKES

- A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike where specified.
1. Manufacturers:
    - a. Folger Adam EDC (FO).
    - b. HES (HS).
  - B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

## 2.10 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
  2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
  3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
  4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
  5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
  7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
  8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
    - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    - b. Sargent Manufacturing (SA) - 80 Series.
    - c. Von Duprin (VD) - 35A/98 XP Series.

## 2.11 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
  2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
  4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
  5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.



7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:

- a. Corbin Russwin Hardware (RU) – DC6000 Series.
- b. Sargent Manufacturing (SA) - 351 Series.
- c. Norton Door Controls (NO) - 7500 Series.
- d. Yale Locks and Hardware (YA) - 4400 Series.

- C. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:

- a. Corbin Russwin Hardware (RU) - DC6000 Series.
- b. Norton Door Controls (NO) - 8500 Series.
- c. Sargent Manufacturing (SA) - 1431 Series.
- d. Yale Locks and Hardware (YA) - 3500 Series.

## 2.12 ARCHITECTURAL TRIM

- A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW). Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
  - a. Hiawatha, Inc. (HI).
  - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
  - c. Trimco (TC).

## 2.13 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  1. Manufacturers:
    - a. Hiawatha, Inc. (HI).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  1. Manufacturers:
    - a. Rixson Door Controls (RF).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Sargent Manufacturing (SA).

## 2.14 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
  - 1. National Guard Products (NG).
  - 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
  - 3. Reese Enterprises, Inc. (RE).

## 2.15 ELECTRONIC ACCESSORIES

- A. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.
  - 1. Manufacturers:
    - a. Security Door Controls (SD) - 400 Series.
    - b. Securitron (SU) - PB Series.
- B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
  - 1. Manufacturers:
    - a. Security Door Controls (SD) - DPS Series.
    - b. Securitron (SU) - DPS Series.
- C. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
  - 1. Manufacturers:
    - a. Security Door Controls (SD) - 630 Series.

- b. Securitron (SU) - BPS Series.

## 2.16 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.17 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.

- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### Hardware Sets

#### Set: 2.0

Doors: 105E, 111A

1 Existing Existing all to remain

Notes: REKEY EXISTING LOCK/EXIT DEVICE.

#### Set: 3.0

Doors: 105D, 113C

3 Hinge (heavy weight)	<u>T4A3386 NRP 4-1/2" x 4-1/2"</u>	US32D	MK
1 Storeroom Lock	<u>3 LC 8204 LNL</u>	US32D	SA
1 Cylinder Rim/Mortise IC or Fixed	as Required (match existing key system)		
1 Surface Closer	<u>CPS7500</u>	689	NO
1 Threshold	<u>171A</u>		PE
1 Gasketing	<u>2891AS</u>		PE
1 Rain Guard	<u>346C</u>		PE
1 Sweep	<u>3452AV</u>		PE

#### Set: 9.0

Doors: 122B

3 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Classroom Lock	<u>LC 28 10G37 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder key in lever IC or Fixed	as required (match existing key system)		
1 Surface Closer	<u>8501</u>	689	NO
1 Wall Stop	<u>409</u>	US26D	RO
1 Gasketing	<u>ACP112BL</u>		PE
1 Gasketing	<u>S773D</u>		PE
1 Door Bottom	<u>411ARL</u>		PE

#### Set: 10.0

Doors: 107

1 Storeroom Lock	<u>LC 28 10G04 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder Rim/Mortise IC or Fixed	as Required (match existing key system)		

Notes: ALL REMAINING HARDWARE IS EXISTING AND SHALL REMAIN. GC TO FIELD VERIFY CYLINDRICAL OR MORTISE LOCK PREP. ADVISE IF SPECIFIED LOCKSET IS NOT COMPATABLE WITH EXISTING DOOR PREP.

**Set: 11.0**Doors: 108

1 Privacy Set	<u>28 10U65 LL</u>	US26D	SA
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Notes: ALL REMAINING HARDWARE IS EXISTING AND SHALL REMAIN. GC TO FIELD VERIFY CYLINDRICAL OR MORTISE LOCK PREP. ADVISE IF SPECIFIED LOCKSET IS NOT COMPATABLE WITH EXISTING DOOR PREP.

**Set: 12.0**Doors: 109

1 Passage Set	<u>28 10U15 LL</u>	US26D	SA
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Notes: ALL REMAINING HARDWARE IS EXISTING AND SHALL REMAIN. GC TO FIELD VERIFY CYLINDRICAL OR MORTISE LOCK PREP. ADVISE IF SPECIFIED LOCKSET IS NOT COMPATABLE WITH EXISTING DOOR PREP.

**Set: 13.0**Doors: 110A, 117, 118, 119, 120, 121, 122, 122D, 123, 123B

3 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Classroom Lock	<u>LC 28 10G37 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder key in lever IC or Fixed	<u>as required (match existing key system)</u>		
1 Surface Closer	<u>8501</u>	689	NO
1 Wall Stop	<u>409</u>	US32D	RO
1 Gasketing	<u>S773D</u>		PE

Notes: 8501ST CLOSER @ 122, 122D, 123.

**Set: 14.0**Doors: 110B

3 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Classroom Lock	<u>LC 28 10G37 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder key in lever IC or Fixed	<u>as required (match existing key system)</u>		
1 Surface Closer	<u>CPS8501</u>	689	NO
1 Door Bottom	<u>411ARL</u>		PE
1 Gasketing	<u>S773D</u>		PE

**Set: 17.0**Doors: 114A, 114B, 116

3 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Push Plate	<u>70C</u>	US32D	RO
1 Pull Plate	<u>110x70C</u>	US32D	RO
1 Surface Closer	<u>8501 DA</u>	689	NO
1 Wall Stop	<u>409</u>	US32D	RO
1 Gasketing	<u>S773D</u>		PE

Notes: 411ARL DOOR BOTTOM AT 114B.

**Set: 18.0**Doors: 115

3 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Storeroom Lock	<u>LC 28 10G04 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder key in lever IC or Fixed	<u>as required (match existing key system)</u>		
1 Surface Closer	<u>8501</u>	689	NO
1 Kick Plate	<u>K1050 10" x 2" LDW 4BE CSK</u>	US32D	RO
1 Wall Stop	<u>409</u>	US32D	RO
1 Gasketing	<u>S773D</u>		PE

**Set: 19.0**

Doors: 104, 127, 127B

3 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Storeroom Lock	<u>LC 28 10G04 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder key in lever IC or Fixed	<u>as required (match existing key system)</u>		
1 Surface Closer	<u>8501ST</u>	689	NO
1 Door Stop	<u>409</u>	US32D	RO
1 Gasketing	<u>S773D</u>		PE

**Set: 20.0**Doors: 124A, 124B

6 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Flush Bolt	<u>2842</u>	US26D	RO
1 Dust Proof Strike	<u>570</u>	US26D	RO
1 Classroom Lock	<u>LC 28 10G37 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder key in lever IC or Fixed	<u>as required (match existing key system)</u>		
1 Coordinator	<u>2600</u>	Black	RO
2 Mounting Bracket	<u>2601 Mounting Brackets</u>	Black	RO
2 Surface Closer	<u>PR8501</u>	689	NO
2 Wall Stop	<u>409</u>	US32D	RO
2 Silencer	<u>608</u>		RO
1 Astragal	<u>303AS</u>		PE
1 Gasketing	<u>S773D</u>		PE
2 Door Bottom	<u>411ARL</u>		PE

**Set: 21.0**Doors: 125, 129

6 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Dust Proof Strike	<u>570</u>	US26D	RO
2 Flush Bolt	<u>555</u>	US26D	RO
1 Storeroom Lock	<u>LC 28 10G04 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder key in lever IC or Fixed	<u>as required (match existing key system)</u>		
2 Surface Closer	<u>8501ST</u>	689	NO
2 Silencer	<u>608</u>		RO
1 Astragal	<u>303AS</u>		PE
1 Gasketing	<u>S773D</u>		PE
2 Door Bottom	<u>411ARL</u>		PE



**Set: 22.0**

Doors: 127A

3 Hinge (heavy weight)	<u>T4A3786 4-1/2" x 4-1/2"</u>	US26D	MK
1 Classroom Lock	<u>LC 28 10G37 LL (IC or Fixed)</u>	US26D	SA
1 Cylinder key in lever IC or Fixed	<u>as required (match existing key system)</u>		
1 Surface Closer	<u>8501</u>	689	NO
1 Wall Stop	<u>409</u>	US32D	RO
2 Gasketing	<u>S88D Double Row for Sound</u>		PE
1 Gasketing	<u>ACP112BL</u>		PE
1 Door Bottom	<u>411ARL</u>		PE

**Set: 24.0**Doors: MISC

1 BITTING LIST	KEY RECORDS		
1 KEY BLANKS	BOX OF 50		
1 Key Cabinet	Sized per specification documents		LU

END OF SECTION 087100

## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Glass for doors, interior borrowed lites, and storefront framing.
  - 2. Glazing sealants and accessories.
- B. Related Requirements:
  - 1. Section 081113 "Hollow Metal Doors and Frames."

#### 1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

## 1.6 WARRANTY

- A. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
  2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as **Btu/sq. ft. x h x deg F (W/sq. m x K)**.
  4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- D. Pyrolytic-Coated, Low-E Glass: Clear float glass with a coating on second surface.

## 2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
  - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
  - 2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
  - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.6 GLAZING SEALANTS

### A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

### B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

## 2.7 GLAZING TAPES

### A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated.

### B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

### A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

### B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

### C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

### D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

### E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

### F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep systems.
  - 3. Minimum required face and edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than **50 inches (1270 mm)**.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide **1/8-inch (3-mm)** minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

#### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.

- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.



- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 MONOLITHIC GLASS SCHEDULE

- A. Glass Type GL-1: Clear, fully tempered float glass.
  - 1. Minimum Thickness: 6 mm.
  - 2. Safety glazing required.
- B. Glass Type GL-2: heat-strengthened float glass.
  - 1. Minimum Thickness: 6 mm.

### 3.9 INSULATING GLASS SCHEDULE

- A. Glass Type IGL-1: Low-E-coated, clear, insulating, fully tempered glass.
  - 1. Overall Unit Thickness: 1 inch (25 mm).
  - 2. Minimum Thickness of Each Glass Lite: 6 mm.
  - 3. Outdoor Lite: Heat-strengthened float glass.
  - 4. Interspace Content: Air.
  - 5. Indoor Lite: Fully tempered float glass.
  - 6. Low-E Coating: Pyrolytic on second surface.
  - 7. Winter Nighttime U-Factor: 0.38 maximum.
  - 8. Summer Daytime U-Factor: 0.38 maximum.
  - 9. Solar Heat Gain Coefficient: 0.4 maximum.
  - 10. Visible Light Transmittance: 60 percent minimum.
  - 11. Safety glazing required.

END OF SECTION 088000

## SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes gypsum board shaft wall assemblies.
- B. Related Sections:
  - 1. Section 092900 "Gypsum Board Assemblies: for finishing gypsum board shaft wall assemblies.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and support them on risers on a flat platform to prevent sagging.

#### 1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.
- B. Do not install panels that are wet, moisture damaged, or mold damaged.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

#### 2.2 GYPSUM BOARD SHAFT WALL ASSEMBLY PER UL 415

- A. Fire-Resistance Rating: 1 hour.
- B. Gypsum Shaftliner Board:

1. Moisture- and Mold-Resistant, Fiberglass-Mat Faced: ASTM C1658/C1658M; manufacturer's proprietary fire-resistive liner panels with ASTM D3273 mold-resistance score of 10 as rated according to ASTM D3274, 1 inch (25.4 mm) thick, and with double beveled long edges.
- C. Non-Load-Bearing Steel Framing, General: Complying with ASTM C645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.
  1. Protective Coating: ASTM A653/A653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.
- D. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:
  1. Depth: 4 inches (102 mm).
  2. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
- E. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches (51 mm) long and matching studs in depth.
  1. Minimum Base-Metal Thickness: Matching steel studs.
- F. Finish Panels: Gypsum board as specified in Section 092900 "Gypsum Board."

## 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than **1/8 inch (3 mm)** from the plane formed by faces of adjacent framing.

### 3.3 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

END OF SECTION 092116.23

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

##### B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; roof and ceiling joists.

#### 1.2 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- ##### A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- ##### B. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).

#### 2.2 FRAMING SYSTEMS

- ##### A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

- ##### B. Studs and Tracks: ASTM C 645.

1. Steel Studs and Tracks:

- a. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection but no less than 0.0296 inch (0.752 mm).
  - b. Depth: As indicated on drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Single Long-Leg Track System: ASTM C 645 top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0329 inch (0.836 mm).
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.0296 inch (0.752 mm).
  2. Depth: 7/8 inch (22.2 mm).
- F. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 3/4 inch (19 mm).
  2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).
  3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.

## 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- C. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

- B. Isolation Strip at Exterior Walls: Provide one of the following:
  - 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
  - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.3 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior concrete walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.

- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum **1/2-inch (13-mm)** clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
- E. Z-Shaped Furring Members:
1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced **24 inches (610 mm)** o.c.
  2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced **24 inches (610 mm)** o.c.
  3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than **12 inches (305 mm)** from corner and cut insulation to fit.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than **1/8 inch (3 mm)** from the plane formed by faces of adjacent framing.

### 3.4 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Suspend hangers from ceiling/roof framing as follows:
1. Install hangers plumb and free from contact with objects within ceiling plenum that are not part of supporting structural or suspension system.



- a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
  3. Wire Hangers: Secure by looping and wire tying, either directly to framing or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- C. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- D. Installation Tolerances: Install suspension systems that are level to within **1/8 inch in 12 feet (3 mm in 3.6 m)** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

## SECTION 092900 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes interior gypsum board.
- B. Related Requirements:
  - 1. Section 054000 "Cold-Formed Metal Framing" for structural steel framing that support gypsum board panels.
  - 2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
  - 3. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.3 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### 1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

### 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

### 2.3 SPECIALTY GYPSUM BOARD

- A. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
  - 1. Core: **5/8 inch (15.9 mm)**, Type X for walls, 1/2 inch for ceilings.
  - 2. Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
  - 1. Thickness: **5/8 inch (15.9 mm)**.
  - 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274

### 2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
  - 2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. L-Bead: L-shaped; exposed long flange receives joint compound.
    - d. Expansion (control) joint.

### 2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

2. Cementitious Backer Units: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  4. Finish Coat: For third coat, use drying-type, all-purpose compound.
  5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Cementitious Backer Units:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.

## 2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch (1.5 mm)** of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft. (0.7 sq. m)** in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow **1/4- to 3/8-inch- (6.4- to 9.5-mm-)** wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide **1/4- to 1/2-inch- (6.4- to 12.7-mm-)** wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
  - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### 3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840.
- C. Interior Trim: Install in the following locations:
  1. Cornerbead: Use at outside corners unless otherwise indicated.
  2. LC-Bead: Use at exposed panel edges.
  3. L-Bead: Use where indicated.

### 3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  2. Level 3: Where walls will receive plastic wainscot.
  3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Painting."
  4. Level 5: At Conference Room 112, Kitchenette 110, Corridor 111 and Vestibule 113A.
    - a. Primer and its application to surfaces are specified in Section 099123 "Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

1. Level 4: At resinous wall finish.

### 3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

#### 1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: If required, suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.



1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

### 2.3 ACOUSTICAL PANELS

- A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- B. Basis of Design: School Zone Fine Fissured, 1714 by Armstrong Ceiling and Wall Solutions.
  1. Material: Wet-formed mineral fiber with factory-applied latex paint.
- C. Color: White.
- D. Light Reflectance (LR): Not less than 0.85.
- E. Ceiling Attenuation Class (CAC): Not less than 40.
- F. Noise Reduction Coefficient (NRC): Not less than 0.70.
- G. Edge/Joint Detail: Square.
- H. Thickness: **3/4 inch (19 mm)**.
- I. Modular Size: **24 by 48 inches (610 by 1220 mm)**.
- J. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

### 2.4 METAL SUSPENSION SYSTEM

- A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
- B. Basis of Design: Prelude XL by Armstrong Ceiling and Wall Solutions.
- C. Wide-Face, Double-Web, Hot-Dip Galvanized, **G60 (Z180)**, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized, **G60 (Z180)** coating designation; with prefinished, **15/16-inch- (24-mm-)** wide aluminum caps on flanges.
  1. Structural Classification: Intermediate-duty system.
  2. Face Design: Flat, flush.
  3. Cap Finish: Painted white.

## 2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than **0.106-inch- (2.69-mm-)** diameter wire.
- C. Angle Molding: Angles with legs not less than **7/8 inch (22 mm)** wide; formed with **0.04-inch- (1-mm-)** thick, galvanized-steel sheet complying with ASTM A 653/A 653M, **G90 (Z275)** coating designation; with bolted connections and **5/16-inch- (8-mm-)** diameter bolts.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from ceiling/roof members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  6. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
  7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than **16 inches (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
- 3.4 ERECTION TOLERANCES
- A. Suspended Ceilings: Install main and cross runners level to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)**, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)**, non-cumulative.

### 3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

## SECTION 096519 - RESILIENT TILE FLOORING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes rubber floor tile, base, and accessories.
- B. Related Sections: 012200 "Unit Prices."

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Selection: For each type of product.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product to include in maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F (10 deg C)** or more than **90 deg F (32 deg C)**. Store floor tiles on flat surfaces.

#### 1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than **70 deg F (21 deg C)** or more than **95 deg F (35 deg C)**, in spaces to receive floor tile and base 48 hours prior and during installation, and 72 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.

- E. Install products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

### 2.2 RUBBER FLOOR TILE

- A. Basis of Design: Norament Grano tile resilient tile flooring of vulcanized rubber compound as manufactured by Nora Systems, Inc.
- B. Hardness: Grade 2, minimum hardness of 70, measured using Shore, Type A durometer according to ASTM D 2240.
- C. Wearing Surface: Hammered.
- D. Thickness: 0.14 inches (3.5 mm).
- E. Size: 39.5 inches by 39.5 inches (1004 mm x 1004 mm).
- F. Colors and Patterns: As selected from manufacturer's standard range.

### 2.3 THERMOPLASTIC RUBBER BASE

- A. Basis of Design: Roppe 700 Series.
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
  - 1. Group: II (layered).
  - 2. Style: Cove.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length.
- F. Inside and Outside Corners: Job formed.
- G. Colors: As selected from Manufacturer's full range.

## 2.4 RUBBER MOLDING ACCESSORY

- A. Description: Rubber reducer strip or transition strip.
- B. Locations: Provide rubber molding reducer strip or transition strip for resilient floor covering to concrete.
- C. Colors and Patterns: As selected from Manufacturer's full range.

## 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
  - 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

- a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of Insert rate in 24 hours.
  - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Moisture Vapor Transmission Coating System: Apply vapor transmission coating in manufacturer's recommended thickness where testing shows moisture-vapor emissions are not within acceptable levels. Follow requirements of 012200 "Unit Prices."
- E. Do not install products until materials are the same temperature as space where they are to be installed.
1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by products.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate with V-notched trowel to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.



### 3.4 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than **3 inches (76 mm)** in length. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than **3 inches (76 mm)** in length. Miter or cope corners to minimize open joints.

### 3.5 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

### 3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

## SECTION 096723 - RESINOUS FLOORING AND WALL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes resinous flooring and wall systems.
- B. Related Sections: 012200 "Unit Prices."

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Flammability: Self-extinguishing according to ASTM D 635.

### 2.2 MANUFACTURERS

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- B. Basis of Design: Quartz Cremona Granite Series TG by Desco Coatings.

### 2.3 RESINOUS FLOORING AND WALL SYSTEM

- A. Resinous Flooring and Wall System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor, integral cove base, and walls.
- B. System Characteristics:
  - 1. Color and Pattern: As selected from manufacturer's standard range.
  - 2. Wearing Surface:
    - a. In showers: Course for slip resistance.
    - b. In drying areas: Medium texture.
    - c. In restrooms: Orange Peel, easily cleaned surface with slight texture.
  - 3. Overall System Thickness: **3/16 inch (4.8 mm)**.
- C. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
- D. Reinforcing Membrane: Flexible resin formulation that is recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
- E. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- F. Body Coats:
  - 1. Resin: Epoxy.
  - 2. Type: Clear.
  - 3. Application Method: Troweled.
  - 4. Number of Coats: Two.
  - 5. Aggregates: Grade 11 colored quartz aggregate (ceramic-coated silica).
- G. Topcoats: Sealing or finish coats.

1. Resin: Urethane.
2. Type: Clear.
3. Number of Coats: As required by manufacturer's system.
4. Finish: Matte.

H. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 10,000 psi minimum according to ASTM C 579.
2. Tensile Strength: 2,250 psi minimum according to ASTM C 307.
3. Flexural Modulus of Elasticity: 4,000 psi minimum according to ASTM C 580.
4. Resistance to Elevated Temperature: No slip or flow of more than **1/16 inch (1.6 mm)** according to MIL-D-3134J.
5. Abrasion Resistance: 0.08 gm maximum weight loss according to ASTM D 4060.
6. Hardness: 85 to 90, Shore D according to ASTM D 2240.

#### 2.4 OTHER MATERIALS MOISTURE VAPOR TRANSMISSION COATING SYSTEM

A. Moisture Vapor Transmission Coating System: Two-component epoxy system approved by flooring system manufacturer used to reduce passage of water vapor and moisture through new and existing slabs.

1. Installation of moisture vapor transmission coating system Unit Price 1 in Specification Section 012200.

B. Joint Filler: Fumed silica thickener and reinforcing filler.

C. Reinforcing Membrane Tape: Approved by flooring installer for

### PART 3 - EXECUTION

#### 3.1 PREPARATION

A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:
  - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
  - b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Remove all residue that might retard interfacial adhesion between concrete and flooring system.
  3. Review condition of concrete to verify extent of reinforcing membraned required.
  4. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
  5. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
    - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of **3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)** of slab area in 24 hours.
    - b. Tramax Concrete Moisture Detection Device: Firmly apply test apparatus device to concrete that has had sealers or other coatings removed. Readings shall be 4.2 present or less. If readings are higher, use ASTM F-2170 for non-conditioned spaces and ASTM F1869 for conditioned spaces.
    - c. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement.
  6. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

### 3.2 APPLICATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
  2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
  3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

- C. Moisture Vapor Transmission Coating System: Apply vapor transmission coating in manufacturer's recommended thickness where testing shows moisture-vapor emissions are not within acceptable levels. Follow requirements of 012200 "Unit Prices."
- D. Reinforcing Membrane: Apply reinforcing membrane to cracks in floor slab to the extent determined after shot blasting. Follow requirements of 012200 "Unit Prices."
- E. Troweled Body Coats: Apply troweled body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids.
  - 1. Build up slope to drain with epoxy resin and aggregate. If thickness exceeds 2 inches, apply in multiple lifts.
  - 2. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.
- F. Integral Cove Base and Walls: Apply mix up wall with 1-inch radius cove. Extend up wall surfaces to ceiling. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating. Do not allow resin to puddle in cove. Round internal and external corners.
- G. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

### 3.3 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

## SECTION 099123 - PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on substrates.
- B. Related Requirements:
  - 1. Section 033000 "Miscellaneous Cast-in-Place Concrete" for concrete floor sealers.
  - 2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, **8 inches (200 mm)** square.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

#### 1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: **1 gal. (3.8 L)** of each material and color applied.

#### 1.4 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 (7 deg C)**.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.



## 1.5 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to products listed in the Painting Schedule for the paint category indicated.
  - 1. Basis of Design: The Sherwin-Williams Company. Products of other manufacturers may be submitted for review with appropriate supporting material.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Materials for use within each paint system shall be 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 paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: As selected from manufacturer's full range.
  - 1. Ten percent of surface area will be painted with deep tones.

## PART 3 - EXECUTION

### 3.1 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.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer SSPC-SP 2.
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. 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 paints.
- H. Aluminum Substrates: Remove loose surface oxidation.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in occupied (non-warehouse or storage) spaces:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Other items as directed by Architect.

### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 PAINTING SCHEDULE

- A. Interior and Exterior Ferrous Metal (Doors, Frames and Miscellaneous Metals):

1. Acrylic, Semi-Gloss Finish:
  - a. Prime Coat: Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
  - b. Intermediate Coat: Pro Industrial Acrylic Semi-Gloss, B66-650 Series.
  - c. Topcoat: Pro Industrial Acrylic Semi-Gloss, B66-650 Series.
  
- B. Gypsum Board Substrates:
  1. Latex System, Egg Shell Finish (in Offices, Crew Rooms, Conference Rooms, Kitchenette, Libraries):
    - a. Prime Coat: ProMar 200 Zero VOC Latex Primer, B28W2600.
    - b. Intermediate Coat: ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series.
    - c. Topcoat: ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series.
  
  2. High-Performance Water-Based Epoxy System, Egg Shell Finish (Restrooms, Locker Rooms including ceilings, Janitor's Closet, Corridors, Vestibules, and Warehouse sides of Gypsum Board walls):
    - a. Prime Coat: ProMar 200 Zero VOC Latex Primer, B28W2600.
    - b. Intermediate Coat: Pro Industrial Pre-Catalyzed Water-based Epoxy Semi-Gloss, K46 Series.
    - c. Topcoat: Pro Industrial Pre-Catalyzed Water-based Epoxy Semi-Gloss, K46 Series.

END OF SECTION 099123

## SECTION 102113.19 - PLASTIC TOILET COMPARTMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for blocking.
2. Section 102116.19 for plastic shower and dressing compartments.
3. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.

C. Samples for Selection: Actual samples for each type of material, color, and finish required.

#### 1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

#### 1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

## 1.5 WARRANTY

- A. Provide manufacturer's 25-year warranty against breakage, corrosion, and delamination under normal conditions.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 200 or less.
  - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

### 2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Toilet-Enclosure Style: Overhead braced.
- B. Urinal-Screen Style: Wall hung.
- C. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than **1 inch (25 mm)** thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
  - 1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
  - 2. Color and Pattern: One color and pattern in each room.
- D. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- E. Brackets (Fittings):
  - 1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum.

### 2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
  - 1. Hinges: Manufacturer's standard paired, of heavy-duty extruded aluminum with bright dip anodized finish, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.

2. Latch and Keeper: Manufacturer's standard latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
  3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
  4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
  5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

## 2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ~~ASTM B 221~~ (ASTM B 221M).
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.
- G. Zamac: ASTM B 86, commercial zinc-alloy die castings.

## 2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Door Size and Swings: Unless otherwise indicated, provide ~~24-inch-~~ (610-mm-) wide, in-swinging doors for standard toilet compartments and ~~36-inch-~~ (914-mm-) wide, out-swinging doors with a minimum ~~32-inch-~~ (813-mm-) wide, clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
  - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: **1/2 inch (13 mm)**.
    - b. Panels and Walls: **1 inch (25 mm)**.
  - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
    - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

### 3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.19



## SECTION 102116.19 - PLASTIC SHOWER AND DRESSING COMPARTMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Solid-plastic compartments.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for blocking.
2. Section 102113.19 for plastic toilet compartments and urinal screens.
3. Section 102800 "Toilet, Bath, and Laundry Accessories" for grab bars, purse shelves, and similar accessories.
4. Division 22000 specification sections for shower heads, valves, and controls.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For shower and dressing compartments.

1. Include plans, elevations, sections, and attachment details.
2. Include trench drain locations in relation to floor attachments.

C. Samples for Selection: Actual samples of each type of material, color, and finish required.

#### 1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For shower and dressing compartments to include in maintenance manuals.

#### 1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of fixtures, drains, walls, columns, ceilings, and other construction contiguous with shower and dressing compartments by field measurements before fabrication.

## 1.5 WARRANTY

- A. Provide manufacturer's 25-year warranty against breakage, corrosion, and delamination under normal conditions.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 200 or less.
  - 2. Smoke-Developed Index: 450 or less.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for shower and dressing compartments designated as accessible.

### 2.2 SOLID-PLASTIC COMPARTMENTS

- A. Configuration: Shower and dressing compartments.
- B. Enclosure Style: Overhead braced.
- C. Panel and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges and with homogenous color and pattern throughout thickness of material.
  - 1. Heat-Sink Strip: Manufacturer's standard, continuous, clear-anodized extruded-aluminum or strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
  - 2. Color and Pattern: One color and pattern in each room; as selected by Architect from manufacturer's full range.
- D. Door Construction: Match panels.
- E. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- F. Brackets (Fittings):
  - 1. Full-Height (Continuous) Type: Manufacturer's standard design; clear-anodized extruded aluminum at both shower and dressing compartments.

### 2.3 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.

- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless Steel Castings: ASTM A 743/A 743M.

## 2.4 ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's standard design operating hardware and accessories. Mount to panels with through-bolts.
  - 1. Hinges: Manufacturer's standard, paired, of heavy-duty extruded aluminum with bright dip anodized finish, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.
  - 2. Latch and Keeper: Manufacturer's standard, latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
  - 3. Clothing Hooks: Manufacturer's standard clothing hooks in each dressing compartment; include one combination hook and rubber-tipped bumper at inswinging doors, sized to prevent door from hitting wall panel or compartment-mounted accessories.
  - 4. Door Bumper: Manufacturer's standard, rubber-tipped bumper at outswinging doors.
  - 5. Door Pull: Manufacturer's standard unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing at Dressing Compartment: Manufacturer's standard, continuous, extruded-aluminum headrail or cap with antigrip profile; in manufacturer's standard finish.
- C. Headrail with Hooks at Shower Compartment: Manufacturer's standard, continuous, extruded-aluminum headrail or cap with curtain hooks running in concealed track; with antigrip profile; in manufacturer's standard finish.
- D. Curtain: Flame-resistant, manufacturer's standard fabric that is stain resistant, self-sanitizing, antistatic, antimicrobial, and launderable.
  - 1. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches (152 mm) o.c.; machined into top hem.
  - 2. Width: Minimum 6 inches (152 mm) wider than opening.
  - 3. Length: Where curtain extends to a floor surface, size so that bottom hem clears finished floor by not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) above floor surface.
- E. Soap Holder: Surface-mounted, seamless stainless steel soap dish.
- F. Seats in Dressing Compartment: Manufacturer's standard, panel-mounted benches.

1. Material: Molded plastic.
  2. Operation: Fixed.
  3. Finish: Match enclosure panels.
- G. Anchorages and Fasteners: Manufacturer's standard, exposed fasteners of stainless steel, chrome-plated steel, or solid brass, finished to match the items they are securing; with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. Use countersunk, flush-type bolt heads or otherwise make fasteners inconspicuous if exposed on opposite side of panel from hardware or accessory item. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

## 2.5 FABRICATION

- A. Overhead-Braced Compartments: Manufacturer's standard, corrosion-resistant supports, leveling method, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling method.
- B. Door Sizes and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, inswinging doors for standard shower and dressing compartments, and 36-inch- (914-mm-) wide, outswinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended anchoring devices.
1. Clearances for Dressing Compartments: Maximum 1/2 inch (13 mm) between pilasters and panels; 1 inch (25 mm) between panels and walls.
  2. Full-Height (Continuous) Brackets for Dressing Compartments: Secure panels to walls and to pilasters with full-height brackets.
    - a. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Compartments: Secure pilasters to floor, and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous headrail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Curtains: Install curtains to specified length, and verify that they hang vertically without stress points or diagonal folds.

### 3.2 ADJUSTING

- A. **Curtain Adjustment:** After hanging curtains, test and adjust each track or rod to produce unencumbered, smooth operation. Steam and dress down curtains as required to produce crease- and wrinkle-free installation. Remove and replace curtains that are stained or soiled or that have stress points or diagonal folds.
- B. **Hardware Adjustment:** Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 102116.19

## SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Underlavatory guards.
4. Custodial accessories.

#### 1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

## 1.6 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, visible silver spoilage defects.
  - 2. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 OWNER-FURNISHED MATERIALS

- A. Owner-Furnished Materials: Toilet tissue dispensers, paper towel dispensers, soap dispensers, waste receptacles.

### 2.2 PERFORMANCE REQUIREMENTS

- 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.

### 2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

- B. Grab Bar:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Specialties, Inc.
  - b. Bobrick Washroom Equipment, Inc.
  - c. Bradley Corporation.
  - d. GAMCO Specialty Accessories; a division of Bobrick.
- 2. Mounting: Flanges with concealed fasteners.
- 3. Material: Stainless steel, **0.05 inch** thick.
  - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
- 4. Outside Diameter: **1-1/2 inches**.
- 5. Configuration and Length: As indicated on Drawings.

- C. Mirror Unit (FM):

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [American Specialties, Inc.](#)
  - b. [Bobrick Washroom Equipment, Inc.](#)
  - c. [Bradley Corporation.](#)
  - d. [GAMCO Specialty Accessories; a division of Bobrick.](#)
2. Frame: Stainless-steel angle, **0.05 inch** thick or Stainless-steel channel.
    - a. Corners: Manufacturer's standard.
  3. Integral Shelf: **5 inches** deep.
  4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
    - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
    - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
  5. Size:
    - a. 48 inches wide by 48 inches high.
    - b. 96 inches wide by 48 inches high.
    - c. 24 inches wide by 48 inches high.

#### 2.4 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Source Limitations: Obtain public-use shower room accessories from single source from single manufacturer.
- B. Shower Curtain Rod (provide at accessible showers):
  1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
    - a. [American Specialties, Inc.](#)
    - b. [Bobrick Washroom Equipment, Inc.](#)
    - c. [Bradley Corporation.](#)
    - d. [GAMCO Specialty Accessories; a division of Bobrick.](#)
  2. Description: **1-1/4-inch** OD; fabricated from nominal **0.05-inch-** thick stainless steel.
  3. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
  4. Finish: Stainless steel, No. 4 finish (satin).
- C. Shower Curtain (provide where shower curtain rods are indicated):
  1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
    - a. [American Specialties, Inc.](#)
    - b. [Bobrick Washroom Equipment, Inc.](#)
    - c. [Bradley Corporation.](#)



- d. [GAMCO Specialty Accessories; a division of Bobrick.](#)
  2. Size: Minimum **12 inches** wider than opening by **72 inches** high.
  3. Material: Nylon-reinforced vinyl, minimum **10 oz. (284 g)** or **0.008-inch- (0.2-mm-)** thick vinyl, with integral antibacterial agent.
  4. Color: White.
  5. Grommets: Corrosion resistant at minimum **6 inches** o.c. through top hem.
  6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
- D. Folding Shower Seat (provide at accessible showers):
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
    - a. [American Specialties, Inc.](#)
    - b. [Bobrick Washroom Equipment, Inc.](#)
    - c. [Bradley Corporation.](#)
    - d. [GAMCO Specialty Accessories; a division of Bobrick.](#)
  2. Configuration: L-shaped seat, designed for wheelchair access.
  3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in white.
  4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
  5. Dimensions: 33 inches wide by 22-5/16 inches deep.
- E. Soap Dish (provide at accessible showers):
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
    - a. [American Specialties, Inc.](#)
    - b. [Bobrick Washroom Equipment, Inc.](#)
    - c. [Bradley Corporation.](#)
    - d. [GAMCO Specialty Accessories; a division of Bobrick.](#)
  2. Description: With washcloth bar.
  3. Mounting: Recessed.
  4. Material and Finish: Stainless steel, No. 4 finish (satin).

## 2.5 UNDERLAVATORY GUARDS

- A. Underlavatory Guard (provide at wall mounted sinks with exposed piping below):
1. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
  2. Material and Finish: Antimicrobial, molded plastic, white.

## 2.6 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Mop and Broom Holder:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Specialties, Inc.
  - b. Bobrick Washroom Equipment, Inc.
  - c. Bradley Corporation.
  - d. GAMCO Specialty Accessories; a division of Bobrick.
2. Description: Unit with shelf, hooks, and holders beneath shelf.
3. Length: 34 inches (914 mm).
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
  - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.
  - b. Rod: Approximately 1/4-inch- (6-mm-) diameter stainless steel.

## 2.7 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

## 2.8 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least **250 lbf (1112 N)**, when tested according to ASTM F 446.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

## SECTION 105113 – SOLID PLASTIC LOCKERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes: Solid plastic lockers and locker room benches.
- B. Related Requirements:
  - 1. Section 061053 "Miscellaneous rough Carpentry" for blocking required for installation.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: For lockers.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Show locker trim and accessories.
  - 3. Include locker identification system and numbering sequence.
- C. Samples: For each color specified, in manufacturer's standard size.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

#### 1.5 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

## 1.6 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that lockers can be supported and installed as indicated.

## 1.7 WARRANTY

- A. Provide manufacturer's 25-year warranty against breakage, corrosion, and delamination under normal conditions.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

### 2.3 SOLID PLASTIC LOCKERS

- A. Materials: High-Density Polyethylene (HDPE): polyethylene thermoplastic formed into solid plastic components, color selected from Manufacturer's standard color range.
- B. Locker Configuration: Two-tier height with full-height (60 inches) garments storage over open shelf/cubby (12 inches). Provide upper shelf 10" from top of full-height garment storage unit.
- C. Locker Dimensions:
  - 1. Overall Locker Height: 72 inches.
  - 2. Width: 15 inches.
  - 3. Depth: 18 inches.
- D. Doors and Frame: 1/2-inch thick HDPE plastic.
  - 1. Doors: Horizontal venting.
  - 2. Handle: ADA-compliant of injectable plastic capable of accommodating padlock by Owner.
  - 3. Hinge: Heavy-duty extruded aluminum with corrosion-free stainless steel pin with silver finish.
  - 4. ADA-Compliance Package: 3134 aluminum series 1100, H18, stain matte finish ADA plaque, adjustable 3/8-inch HDPE plastic shelf with plastic clips.

5. Latch Bar: 3/8-inch thick HDPE plastic with multiple latch points, fastened with stainless steel, tamper-resistant screws.
- E. Sides, Top, Bottoms, Backs, and Shelves: 3/8-inch thick HDPE plastic, grey finish.
- F. Finished Locker Tops: Slope top to match locker doors, field cut to fit, with 1-inch thick rear support members.
- G. Accessories:
  1. Coat Hook: Two-prong, high-impact plastic, black finish, mounted to bottom of shelf, one per door opening.
  2. Wall Hooks: Three per door opening.
  3. End Panels: 1/2-inch thick HDPE plastic, color and finish same as locker door.
  4. Filler Panels: 1/2-inch thick HDPE plastic, color and finish same as locker door.
  5. Number Plate: 3134 aluminum, Series 1100, H18, satin matte finish, fastened to locker with corrosion-resistant stainless steel rivets.
  6. Locker Base: 1-inch thick by 4-inch high HDPE plastic with black finish, field assembly required.

## 2.4 LOCKER BENCHES

- A. Provide bench units with overall assembly height of **17-1/2 inches (445 mm)**.
- B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
  1. Size: 1-1/2-inch thick HDPE plastic by 9-1/2-inch wide by length shown on drawings.
  2. Color: Color selected from Manufacturer's standard color range.
- C. Fixed-Bench Pedestals: Manufacturer's standard aluminum supports, 16 inches high, secured to bench tops with stainless steel tamper-resistant Torx head screws and secured to the floor with lead expansion shields and 2-inch long stainless steel machine bolts.

## 2.5 FABRICATION

- A. Fabricate lockers square, rigid, without warp, and with faces flat and free of scratches, chips, dents or distortion.
  1. Form body panels, doors, shelves, and accessories from one-piece unless otherwise indicated.
  2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate locker components for snap-together assembly or slide together dovetail connections providing solid, secure, and anti-racking construction.
- C. Fabricate each locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.
- D. Fabricate locker benches in single lengths to sizes indicated.

- E. Accessible Lockers: Fabricate as follows:
  - 1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
  - 2. Where hooks or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
- F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to lockers.
  - 1. Sloping-top corner fillers, mitered.
- G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- H. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
  - 1. Provide one-piece panels for double-row (back-to-back) locker ends.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls and floors with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Assemble locker bases in field according to manufacturer's written instructions. Secure bases to floor, shimming where required to make bases level and plumb.
- B. Install lockers level, plumb, and true; shim as required, using concealed shims.
  - 1. Set lockers on prepared locker base.
  - 2. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
  - 3. Anchor single rows of metal lockers to walls near top and bottom of lockers.
- C. Equipment:
  - 1. Attach hooks with at least two fasteners.
  - 2. Identification Plates: Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

3. Install ADA kit where indicated on plans.
- D. Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on locker-to-wall installation.
  2. Attach sloping-top units to lockers, with closures at exposed ends.
  3. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of lockers.
- E. Fixed Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than **72 inches (1830 mm)** apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

### 3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

### 3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113



## SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes plastic-laminate-clad countertops.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plastic-laminate-clad countertops.
  - 1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
  - 2. Show locations and sizes of cutouts and holes for items installed in plastic-laminate-clad countertops.
- C. Samples: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.

## 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
  - 1. Shop Certification: AWI's Quality Certification Program accredited participant or WI's Certified Compliance Program licensee.
- B. Installer Qualifications: AWI's Quality Certification Program accredited participant or WI's Certified Compliance Program licensee.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.
- B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

- C. Keep surfaces of countertops covered with protective covering during handling and installation.

## 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until HVAC system in area of work is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## PART 2 - PRODUCTS

### 2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
  - 1. The Contract Documents may contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As selected from manufacturer's full range.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- F. Core Material: Particleboard or MDF.
- G. Core Material at Sinks: Particleboard made with exterior glue or MDF made with exterior glue.
- H. Core Thickness: 3/4 inch (19 mm).
  - 1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.
- I. Paper Backing: Provide paper backing on underside of countertop substrate.

## 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.
  - 1. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.
  - 2. Particleboard: ANSI A208.1, Grade M-2, Grade M-2-Exterior Glue at sink.

## 2.3 FABRICATION

- A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of **1 inch (25 mm)** over base cabinets.
- B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing.

### 3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within **6 inches (150 mm)** of front and back edges and at intervals not exceeding **24 inches (600 mm)**. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a **1/8-inch-in-96-inches (3-mm-in-2400-mm)** variation from a straight, level plane.
  2. Secure backsplashes to tops with concealed metal brackets at **16 inches (400 mm)** o.c. and to walls with adhesive.
  3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semiexposed surfaces.
- C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of **48 inches (1220 mm)** o.c. Remove protection at Substantial Completion.

END OF SECTION 123623.13

## SECTION 211000 - AUTOMATIC SPRINKLER SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Pipes, fittings, and specialties
2. Specialty valves.
3. Sprinklers.

##### B. Scope of Project:

1. Wet Pipe fire sprinkler system throughout building.
2. Modify existing fire sprinkler system for hazards as shown on plans.
3. Provide additional gate valve per KCMO requirements at system entry with tamper switch.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of product.

##### B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

##### C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Coordination Drawings: Sprinkler systems, drawn to scale, on which items of other systems and equipment are shown and coordinated with each other, using input from installers of the items involved.

##### B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

##### C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

##### D. Field quality-control reports.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of current fire-hydrant flow test.
  - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with NFPA 13.
- B. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.
- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems. Contractor shall obtain/provide a current hydrant flow test and base calculations on test results.
  1. Available fire-hydrant flow test records indicate the following conditions:
    - a. Date: 11/8/2017.
    - b. Performed by: Jayhawk Fire Sprinkler Co.
    - c. Location of Residual Fire Hydrant R: SE Corner Guinotte & Montgall.
    - d. Location of Flow Fire Hydrant F: NE of Guinotte & Montgall.
    - e. Static Pressure at Residual Fire Hydrant R: 150 psig (kPa).
    - f. Measured Flow at Flow Fire Hydrant F: 1278 gpm (L/s).
    - g. Residual Pressure at Residual Fire Hydrant R: 120 psig (kPa).
  2. Sprinkler system design shall be approved by authorities having jurisdiction.
    - a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
    - b. Sprinkler Occupancy Hazard Classifications:
      - 1) Automobile Parking Areas: Ordinary Hazard, Group 1.
      - 2) Building Service Areas: Ordinary Hazard, Group 1.
      - 3) Electrical Equipment Rooms: Ordinary Hazard, Group 1.
      - 4) General Storage Areas: Ordinary Hazard, Group 2.

- 5) Libraries: Ordinary Hazard, Group 2.
  - 6) Machine Shops: Ordinary Hazard, Group 2.
  - 7) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
  - 8) Office and Public Areas: Light Hazard.
  - 9) Repair Garages: Ordinary Hazard, Group 2.
3. Minimum Density for Automatic-Sprinkler Piping Design:
- a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. (4.1 mm/min. over 139-sq. m) area.
  - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. (6.1 mm/min. over 139-sq. m) area.
  - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. (8.1 mm/min. over 139-sq. m) area.
4. Maximum Protection Area per Sprinkler:
- a. Office Spaces: 225 sq. ft. (20.9 sq. m).
  - b. Storage Areas: 130 sq. ft. (12.1 sq. m).
  - c. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
  - d. Electrical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
  - e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
- D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.
- 2.2 ABOVE GROUND PIPE AND FITTINGS – Match existing pipe and fittings or provide as follows:
- A. Standard-Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
  - B. Schedule 10, Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250), plain end.
  - C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
  - D. Uncoated-Steel Couplings: ASTM A 865/A 865M, threaded.
  - E. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
  - F. Malleable- or Ductile-Iron Unions: UL 860.
  - G. Cast-Iron Flanges: ASME 16.1, Class 125.
  - H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
    - 1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, ASME B16.21, nonmetallic and asbestos free or EPDM rubber gasket.

- a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
- b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

I. Grooved-Joint, Steel-Pipe Appurtenances:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Anvil International.
  - b. Corcoran Piping System Co.
  - c. National Fittings, Inc.
  - d. Shurjoint Piping Products USA Inc.
  - e. Smith-Cooper International.
  - f. Tyco Fire Products LP.
  - g. Victaulic Company.
- 2. Pressure Rating: 175-psig (1200-kPa).
- 3. Uncoated Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
- 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

J. Steel Pressure-Seal Fittings: UL 213, FM Global-approved, 175-psig (1200-kPa) pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Victaulic Company.

2.3 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Specialty Valves Pressure Rating: 175-psig (1200-kPa) minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Double-Check, Detector-Assembly Backflow Preventers: (Existing)
- G. NRS GATE VALVES

- 1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).



2. Minimum Pressure Rating: 175 psig (1200 kPa).
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron with elastomeric coating].
5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Flanged, Grooved, or Threaded.

H. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Reliable Automatic Sprinkler Co., Inc. (The).
  - b. Tyco Fire Products LP.
2. Standard: UL 1726.
3. Pressure Rating: 175-psig (1200-kPa) minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4 (DN 20).
6. End Connections: Threaded.

## 2.4 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Anvil International.
  - b. National Fittings, Inc.
  - c. Shurjoint Piping Products USA Inc.
  - d. Tyco Fire Products LP.
  - e. Victaulic Company.
2. Standard: UL 213.
3. Pressure Rating: 175-psig (1200-kPa) minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. AGF Manufacturing Inc.
  - b. Reliable Automatic Sprinkler Co., Inc. (The).
  - c. Tyco Fire Products LP.
  - d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
  3. Pressure Rating: 175-psig (1200-kPa) minimum.
  4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
  5. Size: Same as connected piping.
  6. Inlet and Outlet: Threaded or grooved.
- C. Branch Line Testers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Elkhart Brass Mfg. Co., Inc.
    - b. Fire-End & Croker Corporation.
    - c. Potter Roemer LLC.
  2. Standard: UL 199.
  3. Pressure Rating: 175 psig (1200 kPa).
  4. Body Material: Brass.
  5. Size: Same as connected piping.
  6. Inlet: Threaded.
  7. Drain Outlet: Threaded and capped.
  8. Branch Outlet: Threaded, for sprinkler.
- D. Sprinkler Inspector's Test Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AGF Manufacturing Inc.
    - b. Triple R Specialty.
    - c. Tyco Fire Products LP.
    - d. Victaulic Company.
    - e. Viking Corporation.
  2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
  3. Pressure Rating: 175-psig (1200-kPa) minimum.
  4. Body Material: Cast- or ductile-iron housing with sight glass.
  5. Size: Same as connected piping.
  6. Inlet and Outlet: Threaded.
- E. Adjustable Drop Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Aegis Technologies, Inc.
  - b. CECA, LLC.
  - c. Corcoran Piping System Co.
  - d. Merit Manufacturing.
- 2. Standard: UL 1474.
  - 3. Pressure Rating: 250-psig (1725-kPa) minimum.
  - 4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
  - 5. Size: Same as connected piping.
  - 6. Length: Adjustable.
  - 7. Inlet and Outlet: Threaded.
- F. Flexible Sprinkler Hose Fittings:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. FlexHead Industries, Inc.
    - b. Victaulic Company
  - 2. Standard: UL 1474.
  - 3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
  - 4. Pressure Rating: 175-psig (1200-kPa) minimum.
  - 5. Size: Same as connected piping, for sprinkler.

## 2.5 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Globe Fire Sprinkler Corporation.
  - 2. Reliable Automatic Sprinkler Co., Inc. (The).
  - 3. Tyco Fire Products LP.
  - 4. Venus Fire Protection Ltd.
  - 5. Victaulic Company.
  - 6. Viking Corporation.
- B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- C. Pressure Rating for Automatic Sprinklers: 175-psig (1200-kPa) minimum.
- D. Automatic Sprinklers with Heat-Responsive Element:
- 1. Nonresidential Applications: UL 199.
  - 2. Characteristics: Nominal 1/2-inch (12.7-mm) orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- E. Sprinkler Finishes: Chrome plated, bronze and painted.

- F. Special Coatings: Wax lead and corrosion-resistant paint.
- G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
  - 1. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch (25-mm) vertical adjustment.
  - 2. Sidewall Mounting: Chrome-plated steel, one piece, flat.
- H. Sprinkler Guards:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Reliable Automatic Sprinkler Co., Inc. (The).
    - b. Tyco Fire Products LP.
    - c. Victaulic Company.
    - d. Viking Corporation.
  - 2. Standard: UL 199.
  - 3. Type: Wire cage with fastening device for attaching to sprinkler.

## 2.6 FIRE-DEPARTMENT CONNECTION – (Existing)

## 2.7 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell: (Existing)
  - 1. Standard: UL 464.
  - 2. Type: Vibrating, metal alarm bell.
  - 3. Size: 6-inch (150-mm) minimum 8-inch (200-mm) minimum 10-inch (250-mm) diameter.
  - 4. Finish: Red-enamel factory finish, suitable for outdoor use.
- C. Water-Flow Indicators: (Existing)
  - 1. Standard: UL 346.
  - 2. Water-Flow Detector: Electrically supervised.
  - 3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
  - 4. Type: Paddle operated.
  - 5. Pressure Rating: 250 psig (1725 kPa).
  - 6. Design Installation: Horizontal or vertical.
- D. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.

## 2.8 PRESSURE GAGES (Existing)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. AGF Manufacturing Inc.
  2. AMETEK, Inc.
  3. Ashcroft Inc.
  4. Brecco Corporation.
  5. WIKA Instrument Corporation.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch (90- to 115-mm) diameter.
- D. Pressure Gage Range: 0- to 250-psig (0- to 1725-kPa) minimum.
- E. Label: Include "WATER" or "AIR/WATER" label on dial face.

## PART 3 - EXECUTION

### 3.1 PIPING SCHEDULE

- A. Standard-pressure, wet-pipe sprinkler system, NPS 2 (DN 50) and smaller, shall be the following:
  1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
- B. Standard-pressure, wet-pipe sprinkler system, NPS 1-1/2 and larger, shall be one of the following:
  1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
  2. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

### 3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
  2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
  - C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
  - D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
  - E. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
  - F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
  - G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
  - H. Install sprinkler piping with drains for complete system drainage.
  - I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
  - J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
  - K. Install alarm devices in piping systems.
  - L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
  - M. Fill sprinkler system piping with water.
  - N. Install sleeves for piping penetrations of walls, ceilings, and floors.
  - O. Install sleeve seals for piping penetrations of concrete walls and slabs.
  - P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Two-piece metal chrome finish.
- 3.3 JOINT CONSTRUCTION
- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

- B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

### 3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
  - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
  - 2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
  - 3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

### 3.5 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
  - 1. Rooms without Ceilings: Upright sprinklers.
  - 2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as required.
  - 3. Wall Mounting: Sidewall sprinklers.
  - 4. Spaces Subject to Freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as required.
  - 5. Special Applications: Extended-coverage and quick-response sprinklers where indicated.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
  - 1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
  - 2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
  - 3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
  - 4. Upright, Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

### 3.6 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

### 3.7 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
  - 2. Energize circuits to electrical equipment and devices.
  - 3. Coordinate with fire-alarm tests. Operate as required.



- B. Fire suppression piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.9 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

END OF SECTION 211000

## SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Sleeves.
  - 2. Sleeve-seal systems.
  - 3. Grout.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

### PART 2 - PRODUCTS

#### 2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- C. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

#### 2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. CALPICO, Inc.
  - 3. Metraflex Company (The).
  - 4. Pipeline Seal and Insulator, Inc.
  - 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - 1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

### 2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
  2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
  1. Cut sleeves to length for mounting flush with both surfaces.
  2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

### 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

### 3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  - 1. Exterior Concrete Walls above Grade:
    - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves or Galvanized-steel-pipe sleeves.
    - b. Piping NPS 6 and Larger: Cast-iron wall sleeves or Galvanized-steel-pipe sleeves.
  - 2. Exterior Concrete Walls below Grade:
    - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
  - 3. Concrete Slabs-on-Grade:
    - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves with sleeve-seal system.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
    - b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves with sleeve-seal system.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
  - 4. Concrete Slabs above Grade:
    - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
    - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.
  - 5. Interior Partitions:
    - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
    - b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

- B. PVC Sleeves may NOT be used in plenum spaces used for air movement.

END OF SECTION 220517

## SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Escutcheons.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

### PART 2 - PRODUCTS

#### 2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated or rough-brass finish and setscrew fastener.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
  - 1. Escutcheons for New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
    - c. Insulated Piping in finished spaces: One-piece, cast-brass type or one-piece, stamped-steel type with polished chrome-plated finish.
    - d. Insulated Piping in Unfinished Service Spaces: One-piece, stamped-steel type
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type or one-piece, stamped-steel type with polished chrome-plated finish.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type or one-piece, stamped-steel type with polished chrome-plated finish.
    - g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish or one-piece, stamped-steel type.

- h. Bare Piping in Equipment Rooms: One-piece, cast-brass type with rough-brass finish or one-piece, stamped-steel type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

## SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Bimetallic-actuated thermometers.
  - 2. Thermowells.
  - 3. Dial-type pressure gages.
  - 4. Gage attachments.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

### PART 2 - PRODUCTS

#### 2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ashcroft Inc.
  - 2. Ernst Flow Industries.
  - 3. Marsh Bellofram.
  - 4. Terrice, H. O. Co.
  - 5. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
  - 6. Weiss Instruments, Inc.
- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch nominal diameter.



- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F and deg C.
- E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.
- F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- H. Window: Plain glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

## 2.2 THERMOWELLS

### A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CSA.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

### B. Heat-Transfer Medium: Mixture of graphite and glycerin.

## 2.3 PRESSURE GAGES

### A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Ashcroft Inc.
  - b. Ernst Flow Industries.
  - c. Marsh Bellofram.
  - d. Terice, H. O. Co.
  - e. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

f. Weiss Instruments, Inc.

2. Standard: ASME B40.100.
3. Case: Liquid-filled Sealed type(s); cast aluminum; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi and kPa.
8. Pointer: Adjustable dark-colored metal.
9. Window: Glass.
10. Ring: Stainless steel.
11. Accuracy: Grade 1A, plus or minus 1 percent of full scale range.

## 2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

## 2.5 TEMPERATURE AND PRESSURE GAGE CONNECTOR PLUGS

- A. Gage Connector Plugs:
  1. Description: Self closing plug connection for insertion of temporary gages.
  2. Material for Use with Copper Tubing: brass.
  3. Valves: Dual self-closing neoprene.
  4. Fitting: 1/4" to accept a 1/8" OD probe.
  5. Pressure and temperature rating: 500 PSIG at 200F.
  6. Peterson Equipment Co. Pete's Plug II or acceptable equivalent.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install thermowells with socket extending a minimum of 2 inches into fluid or one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.

- E. Install temperature and pressure gage connector plugs where indicated per manufacturer's requirements.
- F. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install valve and snubber in piping for each pressure gage for fluids.
- I. Install thermometers in the following locations:
  - 1. Outlet of each water heater.
  - 2. Inlet and outlet of each domestic hot-water storage tank.
  - 3. Elsewhere as shown.
- J. Install pressure gages in the following locations:
  - 1. Building water service entrance into building.
  - 2. Inlet and outlet of each pressure-reducing valve.
  - 3. Suction and discharge of each domestic water pump. One combination gage may be installed provided suction and discharge readings can be isolated by valves.
- K. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
- L. Adjust faces of meters and gages to proper angle for best visibility.

### 3.2 THERMOMETER SCHEDULE

- A. Thermometers at outlet of each domestic water heater shall be the following:
  - 1. Liquid-filled sealed, bimetallic-actuated type.
- B. Thermometers at inlet and outlet of each domestic hot-water storage tank shall be the following:
  - 1. Liquid-filled sealed, bimetallic-actuated type.
- C. Thermometer stems shall be of length to match thermowell insertion length.

### 3.3 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).
- B. Scale Range for Domestic Hot-Water Piping: 20 to 240 deg F (0 to 150 deg C).

### 3.4 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building shall be the following:
  - 1. Liquid-filled Sealed, direct-mounted, metal case.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:
  - 1. Liquid-filled Sealed, direct-mounted, metal case.
- C. Pressure gages at suction and discharge of each domestic water pump shall be the following:
  - 1. Liquid-filled Sealed, direct-mounted, metal case.

### 3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 160 psi (0 to 1100 kPa).
- B. Scale Range for Domestic Water Piping: 0 to 100 psi (0 to 600 kPa).

END OF SECTION 220519

## SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Bronze swing check valves.

B. Related Sections:

1. Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
2. Section 221116 "Domestic Water Piping" for valves applicable only to this piping.
3. Section 221114 "Facility Natural-Gas Piping."

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

#### 1.3 QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
1. Handlever: For quarter-turn valves NPS 6.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.
  - a. Port: Full.

## 2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Conbraco Industries, Inc.; Apollo Valves.
  - b. Crane Co.; Crane Valve Group; Crane Valves.
  - c. Hammond Valve.
  - d. Milwaukee Valve Company.
  - e. NIBCO INC.
  - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
  - a. Standard: MSS SP-110.
  - b. SWP Rating: 150 psig.
  - c. CWP Rating: 600 psig.
  - d. Body Design: Two piece.
  - e. Body Material: Bronze.
  - f. Ends: Threaded.
  - g. Seats: PTFE or TFE.
  - h. Stem: Bronze.
  - i. Ball: Chrome-plated brass.
  - j. Port: Full.

## 2.3 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Valve, Inc.

- b. Crane Co.; Crane Valve Group; Crane Valves.
- c. Crane Co.; Crane Valve Group; Jenkins Valves.
- d. Crane Co.; Crane Valve Group; Stockham Division.
- e. Hammond Valve.
- f. Milwaukee Valve Company.
- g. NIBCO INC.
- h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 3.
- b. CWP Rating: 200 psig.
- c. Body Design: Horizontal flow.
- d. Body Material: ASTM B 62, bronze.
- e. Ends: Threaded.
- f. Disc: Bronze.

### PART 3 - EXECUTION

#### 3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

#### 3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

#### 3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball.
  - 2. Pump-Discharge Check Valves:
    - a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.

#### 3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

##### A. Pipe NPS 2 and Smaller:

1. Ball Valves: Two piece, full port, bronze with bronze trim.
2. Bronze Swing Check Valves: Class 125, bronze disc.

END OF SECTION 220523



## SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Thermal-hanger shield inserts.
  - 4. Fastener systems.
  - 5. Equipment supports.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
  - 1. Trapeze pipe hangers.
  - 2. Equipment supports.
  - 3. Manufactured pipe hangers.

### PART 2 - PRODUCTS

#### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

## 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

## 2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## 2.4 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

## 2.5 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  1. Properties: Nonstaining, noncorrosive, and nongaseous.
  2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- I. Install piping NPS 4 and larger from top chord of steel joists only.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

- b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
  2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    - b. NPS 4: 12 inches long and 0.06 inch thick.
  5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting." Or Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use thermal-hanger shield inserts for insulated piping and tubing.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
- I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
  2. C-Clamps (MSS Type 23): For structural shapes.
- K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- L. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- M. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

## SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Pipe labels.
- B. Scope includes the labeling of all new piping, equipment and valves in addition to the labeling of ALL EXISTING piping, and equipment that are to remain.

#### 1.2 ACTION SUBMITTAL

- A. Product Data: For each type of product indicated.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Material and Thickness: Brass, 0.032-inch or Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  - 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
  - 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Nomenclature: Labeling nomenclature shall be coordinated with and in accordance with owner instruction and labeling convention.

## 2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of plumbing equipment.
- B. Locate equipment labels where accessible and visible.

### 3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:



1. Domestic Water Piping:
  - a. Background Color: Green.
  - b. Letter Color: White.
  
2. Sanitary Waste and Vent Piping:
  - a. Background Color: Green.
  - b. Letter Color: White.
  
3. Natural Gas Piping:
  - a. Background Color: Yellow.
  - b. Letter Color: Black.

END OF SECTION 220553

## SECTION 220700 - PLUMBING INSULATION

### 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. This Section includes semirigid and flexible plumbing insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
  - 1. Division 23 Section "HVAC Insulation."

#### 1.3 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
- C. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

### 1.6 COORDINATION

- A. Coordinate clearance requirements with pipe Installer for insulation application.

### 1.7 SCHEDULING

- A. Schedule insulation application after testing piping systems. Insulation application may begin on segments of pipes that have satisfactory test results.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mineral-Fiber Insulation:
    - a. CertainTeed Manson.
    - b. Knauf FiberGlass GmbH.
    - c. Owens-Corning Fiberglas Corp.
    - d. Schuller International, Inc.
    - e. Johns Manville
  - 2. Pipe Insulation Jacketing and Fitting Covers:
    - a. Johns Manville/Zeston
    - b. Americasafe
    - c. Speedline Corp.

### 2.2 INSULATION MATERIALS

- A. Mineral-Fiber Pipe Insulation: Glass fibers bonded with a thermosetting resin with a maximum “k” factor of .25 at 70°F for use to 450°F and complying with the following:
  - 1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket. Basis of design: Johns Manville Micro-Lok AP-T Plus.
  - 2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

- a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
  - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
  4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
  5. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
  6. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- B. Prefabricated Thermal Insulating Pipe Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- C. Completely insulate piping system. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

### 2.3 STANDARD JACKET FOR INSULATION

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

### 2.4 FIELD-APPLIED JACKETS

- A. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick, 25/50 flame and smoke rated; roll stock ready for shop or field cutting and forming.
1. Adhesive: As recommended by insulation material manufacturer.
- B. Standard PVC Pipe Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultraviolet-resistant PVC, 25/50 flame and smoke rated.
1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
  2. Adhesive: As recommended by insulation material manufacturer.

### 2.5 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd..
1. Tape Width: 4 inches.

### 2.6 VAPOR RETARDERS

- A. Moisture Barrier: 3-mil Dupont Surlyn
- B. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.
  - 1. Interior Insulation: Water based fire resistive composition with a water permeance of .08 max. and temperature range of -20 to 180° F.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

#### 3.3 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of pipes and fittings.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply multiple layers of insulation with longitudinal and end seams staggered.
- E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- F. Keep insulation materials dry during application and finishing.
- G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- H. Apply insulation with the least number of joints practical.

- I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- L. Apply insulation with integral jackets as follows:
  - 1. Pull jacket tight and smooth.
  - 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
  - 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- N. Install vapor-retarder mastic on insulation scheduled to receive vapor retarders.
  - 1. Insulation Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
  - 2. Insulation without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.
- O. Insulation exposed to Damage: Protect indoor insulation from damage by installation of watertight PVC or aluminum jacket.
- P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
  - 1. Seal penetrations with vapor-retarder mastic.
  - 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
  - 3. Seal insulation to roof flashing with vapor-retarder mastic.
- Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- R. Handicapped Plumbing Fixture Piping: Insulate hot and cold supply and waste piping below the fixture with minimum 1" thick fiberglass with solvent welded PVC jacket and fitting covers.

### 3.4 MINERAL-FIBER INSULATION APPLICATION

- A. Apply insulation to piping flanges as follows:
  - 1. Apply preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

B. Apply insulation to piping fittings and elbows as follows:

1. Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When pre-molded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.

C. Apply insulation to valves and specialties as follows:

1. Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When pre-molded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

### 3.5 FIELD-APPLIED JACKET APPLICATION

A. Insulation Exposed to Weather: Protect outdoor insulation from weather by installing watertight Insulation Exposed to Damage: Protect indoor insulation from damage by installing PVC jacket. Install jacket over piping insulation exposed to damage as follows:

1. Encase insulation completely.
2. Construct each section of jacket using PVC or aluminum.
3. Make seams at the bottom or sides of the pipe, using mechanical fasteners.

### 3.6 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

### 3.7 FIELD QUALITY CONTROL

- A. Insulation applications will be considered defective if on site observation reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

3.8 INDOOR EQUIPMENT APPLICATION SCHEDULE – Equipment shall be as shown in the following table unless otherwise indicated.

- A. Insulate the following indoor equipment:
  - 1. Hot Water Plumbing Pump Bodies
- B. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance.
- C. Omit insulation from the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.

3.9 EQUIPMENT APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

3.10 EQUIPMENT INSULATION SCHEDULE

- A. Hot water Plumbing Pump Bodies.
  - 1. Insulation Material: Mineral Fiber.
  - 2. Insulation Thickness: 2”.

3.11 PIPING SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
  - 1. Flexible connectors.
  - 2. Vibration-control devices.
  - 3. Fire-suppression piping.
  - 4. Below-grade piping, unless otherwise indicated.
  - 5. Chrome-plated pipes and fittings, unless potential for personnel injury or handicapped lavatories and sinks.
  - 6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.12 INTERIOR PIPING INSULATION APPLICATION SCHEDULE



- A. Potable hot and recirculated hot water.
  - 1. Insulation Material: Mineral fiber.
  - 2. Insulation Thickness: 1".
  - 3. Field-Applied Jacket: PVC on all fittings, valves and on all vertical piping exposed to view from 8'-0" down to finish floor..
  - 4. Vapor Retarder Required: Yes.
  
- B. Potable cold water.
  - 1. Insulation Material: Mineral fiber.
  - 2. Insulation Thickness: 1".
  - 3. Field-Applied Jacket: PVC on all fittings, valves and on all vertical piping exposed to view from 8'-0" down to finish floor..
  - 4. Vapor Retarder Required: Yes.
  
- C. Plumbing vents within six linear feet of roof outlet.
  - 1. Insulation Material: Mineral fiber.
  - 2. Insulation Thickness: 2".
  - 3. Vapor Retarder Required: Yes.
  
- D. Exposed sanitary drains and domestic water supplies and stops for fixtures for the disabled.
  - 1. Insulation Material: Mineral fiber.
  - 2. Insulation Thickness: 1".
  - 3. Solvent welded PVC jacket and fitting covers.

END OF SECTION 220700

## SECTION 221113 – FACILITY WATER DISTRIBUTION 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.
- B. Standards and Specifications of the City of Kansas City Water Services Department (KCMO WSD).

## 1.2 SUMMARY

- A. This Section includes piping and specialties for potable-water service and fire suppression service from a point five feet outside of the building to the point of connection with public water supply system.
- B. This Section does not include work related to the public water mains. All work and materials for public water mains is to be in accordance with the 2016 Standards and Specifications for Water Main Extensions and Relocations by the KCMO WSD
- C. The exact location, depth, and extents of the existing water mains for this Project are unknown. It is the Contractor's responsibility to provide verification of the actual field conditions and to construct the work to meet the intent of the Plans and according to the requirements of KCMO WSD. The Contractor should be aware there is additional work required which is not shown on the Plans. ***No additional payment will be made to the Contractor for any work related to the water main work for this Project.***
- D. All work and materials associated with the potable water service is be in conformance with the 2017 Rules and Regulations for Water Service Lines by the KCMO WSD. In the event of a discrepancy between this document and the information contained in this Section, the KCMO WSD document shall govern.
- E. This Section includes furnishing and installing all fittings required to construct the work whether or not such fittings are indicated on the drawings.
- F. Entity responsible for public water supply system will furnish water meters and perform tapping of public water supply according to their standards. Contractor is responsible for coordinating with entity to determine the extent of this work and materials supplied.
- G. Related Sections include the following:
  - 1. Division 22 Sections for potable-water piping within the building to a point five feet outside of the building.

## 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: Potable-Water Service: 160 psig.

#### 1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
  - 1. Each sheet or page of each submittal whether shop drawings or product data, shall bear the review stamp of the Contractor indicating the submittal has been reviewed and is approved. Submittals not bearing the Contractor's stamp will be returned without review.
  - 2. Contract drawings may not be reproduced in whole or in part to be utilized as a submittal. Contract drawings reproduced in whole or in part and modified into submittals will not be accepted and will be returned without review.
  - 3. Shop drawings shall be complete for each component or item. Indicate all dimensions, location of embedded items, all reinforcing steel sizes, spacing, lengths, and locations. Submission of typical shop drawings for separate components or items but not indicating the specifics of each will not be accepted and will be returned without review.
- B. Product Data: For the following:
  - 1. Water meters.
  - 2. Pipe and fittings.
  - 3. Valves.
  - 4. Fire hydrants.
  - 5. Identification materials and devices
- C. Shop Drawings: For precast concrete structures. Include frames and covers and drains.
- D. Record Drawings: At Project closeout of installed water-service piping according to Division 1 Section "Contract Closeout."
- E. Test Reports: As specified in "Field Quality Control" Article in Part 3.
- F. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.
- G. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include data for the following:
  - 1. Water meters.
  - 2. Valves.
  - 3. Fire hydrants.

#### 1.5 QUALITY ASSURANCE

- A. Comply with requirements of KCMO WSD. Include tapping of water mains and backflow prevention.
- B. Comply with standards of KCMO WSD for potable water-service piping. Include materials, installation, testing, and disinfection.

- C. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," for materials, installations, tests, flushing, and valve and hydrant supervision.

#### 1.6 MATERIAL DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  - 1. Ensure that valves are dry and internally protected against rust and corrosion.
  - 2. Protect valves against damage to threaded ends and flange faces.
  - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
  - 1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.
  - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use hand wheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

#### 1.7 PROJECT CONDITIONS

- A. The existing utility information shown on the Drawings is based on the best available information. The exact location and depth of these utilities are unknown. Contractor shall perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located. Contractor to notify Architect in writing should existing utilities be discovered.
- B. Verify that water piping may be installed to comply with Drawings, these specifications, and referenced standards. Contact Architect immediately if modifications to the design are required.
- C. Site Information: Reports on subsurface condition investigations made during design of Project are available and are for informational purposes only. Data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

- D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Demolish and completely remove from the site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- F. Where utilities require adjustment or relocation to construct the Work, and those utilities are not shown on the Drawings, notify the Architect before proceeding. Relocate or adjust utility as directed. All utility adjustment and/or relocation work shall be at the Contractor's expense, regardless if the utilities are shown on the plans or not.
- G. If utility is damaged by Contractor, notify utility owner and Architect immediately. Repair or replacement of utilities damaged by Contractor, whether such utilities are shown on the drawings or not shown on the drawings, shall be at Contractor's expense.
- H. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of water-distribution service without Architect's written permission.

## 1.8 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with utility company.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.
- C. Coordinate with existing public water main system components.
- D. Coordinate with other utility work.
- E. Coordinate with other site work.

## PART 2 - PRODUCTS

### 2.1 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Ductile-Iron Pipe: AWWA C151, classes 150, 200, and 250

1. Lining: AWWA C104, cement mortar, seal coated.
2. Gaskets, Glands, Bolts and Nuts: AWWA C111.
3. Push-on-Joint Pipe: AWWA C111, rubber gaskets.
4. Mechanical-Joint Pipe: AWWA C111, rubber gaskets ductile iron or cast iron glands, and steel nuts and bolts.
5. Polyethylene encasement per AWWA C105.

## 2.2 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.
- C. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
- D. Ductile-Iron, Flanged Fittings: AWWA C110, with cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550. Include gaskets and bolts and nuts.
- E. Copper Water Tubing: Type K annealed ASTM B88.

## 2.3 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper Water Tubing:
  1. Only flared or compression couplings shall be permitted.
- C. Ductile-Iron Piping: The following materials apply:
  1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
  2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
  3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
    - a. Gaskets: Rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
    - b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.
  1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, malleable iron; or ASTM A 536, ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.
6. Encasement: AWWA C105 polyethylene film, tube or sheet.

## 2.4 PIPING SPECIALTIES

- A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
  2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
  3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum pressure to suit system pressures.
  4. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
    - a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.
  5. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
  6. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225 deg F.

## 2.5 WATER METERS

- A. Coordinate with KCMO WSD. Furnish or obtained as directed.

## 2.6 WATER-METER VAULTS

- A. Furnish according to standard drawings and specifications of utility company.

## 2.7 FIRE HYDRANTS

- A. Description: Cast-iron body, compression-type valve, opening against pressure and closing with pressure, 6-inch mechanical-joint inlet, and 150-psig minimum working-pressure design.
- B. Pre-approved KCMO WSD manufacturer and model.

## 2.8 ANCHORAGES

- A. Clamps, Straps, and Washers: ASTM A 506, steel.
- B. Rods: ASTM A 575, steel.
- C. Rod Couplings: ASTM A 197, malleable iron.
- D. Bolts: ASTM A 307, steel.
- E. Cast-Iron Washers: ASTM A 126, gray iron.
- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig.
  - 1. Cement: ASTM C 150, Type I.
  - 2. Fine Aggregate: ASTM C 33, sand.
  - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
  - 4. Water: Potable.

## 2.9 IDENTIFICATION

- A. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Refer to Division 31 Section "Earth Moving" for excavation, trenching, and backfilling.
- B. Refer to Division 32 Section "Concrete Paving" for cutting and patching of paving.

### 3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- C. Do not use flanges or keyed couplings for underground piping.
  - 1. Exception: Piping in boxes and structures, but not buried, may be joined with flanges or keyed couplings instead of joints indicated.
- D. Flanges, keyed couplings, and special fittings may be used on aboveground piping.
- E. Potable Water-Service Piping: Use the following:
  - 1. ½-Inch to 4-Inch: Type K annealed Copper Pipe per ASTM B88.



2. 4- to 8-Inch: Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
3. 4- to 8-Inch: Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

F. Fire-Protection Water-Service Piping: Use the following:

1. 4- to 8-Inch: Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
2. 4- to 8-Inch: Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

### 3.3 JOINT CONSTRUCTION

- A. Ductile-Iron Piping, Gasketed Joints: According to AWWA C600.
- B. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.
- C. Ductile-Iron, Keyed-Coupling Joints: Cut-groove pipes. Assemble joints with keyed couplings, gaskets, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- D. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

### 3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping at minimum depth and vertical and horizontal clearances as indicated.
- B. Install components with pressure rating equal to or greater than system operating pressure.
- C. Locate pipes parallel to each other to extent practical, spaced to permit valve servicing.
- D. Install fittings for changes in direction and branch connections.
- E. Install underground piping with restrained joints at horizontal and vertical changes in direction as required or indicated on Drawings. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports as indicated on Drawings or required by utility company.
- F. Piping Connections: Unless otherwise indicated, make piping connections as specified below:
  1. Install unions, in piping 2-inch and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch or smaller threaded pipe connection.
  2. Install flanges, in piping 2-1/2-inch and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
  3. Install dielectric fittings to connect piping of dissimilar metals.

### 3.5 BUILDING PLUMBING CONNECTION

- A. Coordinate with interior plumbing contractor for connection to building plumbing systems.
- B. Make connections to previously installed building plumbing systems.
- C. Make connections to existing building plumbing systems.
- D. Terminate piping at a point five feet outside of building wall with caps, plugs, or flanges as required for piping material and as coordinated with interior plumbing contractor.

### 3.6 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Comply with NFPA 24 for fire-protection water-service piping materials and installation.
- C. Bury piping with depth of cover over top at least 48 inches.
- D. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

### 3.7 WATER-METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written requirements.

### 3.8 ROUGHING-IN FOR WATER METERS

- A. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

### 3.9 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back filling of trench for underground water-service piping. Locate 6 to 8 inches below finished grade, directly over piping.
- B. Attach nonmetallic piping label permanently to main electrical meter panel.

### 3.10 HYDROSTATIC AND LEAKAGE TESTING

- A. General: Testing shall be performed by the Contractor in the presence of the Owner's Inspection and Testing Service.
  - 1. Hydrostatic and leakage testing of ductile iron pipe shall comply with current AWWA C600 procedures.

2. Hydrostatic and leakage testing of PCV pipe shall comply with current AWWA C605 procedures.
- B. Hydrostatic Tests: Test systems at not less than 1-1/2 times working pressure for 2 hours.
- C. Leakage Tests: Conduct leakage test concurrently with hydrostatic pressure test.
1. System is acceptable if leakage does not exceed allowable limits of the applicable AWWA standard.
  2. If systems fail testing, correct unsatisfactory system components and retest as necessary until satisfactory results are obtained.
- D. Prepare reports for testing activities.

### 3.11 CLEANING AND DISINFECTION

- A. Clean and disinfect water distribution piping as follows:
1. Flush new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired until turbidity-free water is obtained from all points of outlet.
  2. Fire protection water piping not connected to potable water supply: Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by that authority, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
  3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
    - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine. Isolate system or part thereof and allow to stand for 24 hours.
    - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    - c. Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports for cleaning and disinfecting activities.

END OF SECTION 22 1113

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## SECTION 221114 - FACILITY NATURAL-GAS PIPING

### 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. Pipes, tubes, and fittings.
  - 2. Piping specialties.
  - 3. Piping and tubing joining materials.
  - 4. Valves.
  - 5. Pressure regulators.

#### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
  - 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
  - 2. Service Regulators: 65 psig minimum unless otherwise indicated.
  - 3. Minimum Operating Pressure of Service Meter: 5 psig.
- B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following:

1. Piping specialties.
2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Pressure regulators. Indicate pressure ratings and capacities.
4. Dielectric fittings.

- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data.

## 1.8 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.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

## PART 2 - PRODUCTS

### 2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
  2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

3. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
  - a. Material Group: 1.1.
  - b. End Connections: Threaded or butt welding to match pipe.
  - c. Lapped Face: Not permitted underground.
  - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
  - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

## 2.2 PIPING SPECIALTIES

### A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
3. Operating-Pressure Rating: 0.5 psig.
4. End Fittings: Zinc-coated steel.
5. Threaded Ends: Comply with ASME B1.20.1.
6. Maximum Length: 72 inches

### B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

### C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

## 2.3 JOINING MATERIALS

### A. Joint Compound and Tape: Suitable for natural gas.

## 2.4 MANUAL GAS SHUTOFF VALVES

- A. See "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
  1. CWP Rating: 125 psig.
  2. Threaded Ends: Comply with ASME B1.20.1.

3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
  4. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
  5. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
1. CWP Rating: 125 psig.
  2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
  3. Service Mark: Initials "WOG" shall be permanently marked on valve body.
- D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BrassCraft Manufacturing Company; a Masco company.
    - b. Conbraco Industries, Inc.; Apollo Div.
    - c. Lyall, R. W. & Company, Inc.
    - d. McDonald, A. Y. Mfg. Co.
    - e. Perfection Corporation; a subsidiary of American Meter Company.
  2. Body: Bronze, complying with ASTM B 584.
  3. Ball: Chrome-plated bronze.
  4. Stem: Bronze; blowout proof.
  5. Seats: Reinforced TFE; blowout proof.
  6. Packing: Threaded-body packnut design with adjustable-stem packing.
  7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  8. CWP Rating: 600 psig.
  9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
  10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- E. Bronze Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Lee Brass Company.
    - b. McDonald, A. Y. Mfg. Co.
  2. Body: Bronze, complying with ASTM B 584.
  3. Plug: Bronze.
  4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  5. Operator: Square head or lug type with tamperproof feature where indicated.
  6. Pressure Class: 125 psig.



7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Flowserve.
  - b. Homestead Valve; a division of Olson Technologies, Inc.
  - c. McDonald, A. Y. Mfg. Co.
  - d. Milliken Valve Company.
  - e. Mueller Co.; Gas Products Div.
  - f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

## 2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Actaris.
  - b. American Meter Company.
  - c. Fisher Control Valves and Regulators; Division of Emerson Process Management.
  - d. Invensys.
  - e. Richards Industries; Jordan Valve Div.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.

5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Canadian Meter Company Inc.
  - b. Eaton Corporation; Controls Div.
  - c. Harper Wyman Co.
  - d. Maxitrol Company.
  - e. SCP, Inc.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 1 psig.

## 2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Company.
    - b. Central Plastics Company.
    - c. Hart Industries International, Inc.
    - d. Jomar International Ltd.
    - e. Matco-Norca, Inc.
    - f. McDonald, A. Y. Mfg. Co.

- g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  - h. Wilkins; a Zurn company.
2. Description:
- a. Standard: ASSE 1079.
  - b. Pressure Rating: 125 psig minimum at 180 deg F.
  - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Capitol Manufacturing Company.
  - b. Central Plastics Company.
  - c. Matco-Norca, Inc.
  - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  - e. Wilkins; a Zurn company.
2. Description:
- a. Standard: ASSE 1079.
  - b. Factory-fabricated, bolted, companion-flange assembly.
  - c. Pressure Rating: 125 psig minimum at 180 deg F.
  - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Advance Products & Systems, Inc.
  - b. Calpico, Inc.
  - c. Central Plastics Company.
  - d. Pipeline Seal and Insulator, Inc.
2. Description:
- a. Nonconducting materials for field assembly of companion flanges.
  - b. Pressure Rating: 150 psig.
  - c. Gasket: Neoprene or phenolic.
  - d. Bolt Sleeves: Phenolic or polyethylene.
  - e. Washers: Phenolic with steel backing washers.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

### 3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Steel Piping with Protective Coating:
  - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
  - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
  - 3. Replace pipe having damaged PE coating with new pipe.
- C. Install fittings for changes in direction and branch connections.
- D. Install pressure gage downstream from each service regulator. Pressure gages are specified in Section 220519 "Meters and Gages for Plumbing Piping."

### 3.4 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
  - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 6 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, unless indicated to be exposed to view.
- P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
  - 1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
  - 2. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
    - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
  - 3. Prohibited Locations:

- a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
  - b. Do not install natural-gas piping in solid walls or partitions.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- T. Do not use natural-gas piping as grounding electrode.
- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- V. Install pressure gage downstream from each line regulator. Pressure gages are specified in Section 220519 "Meters and Gages for Plumbing Piping."
- W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."
- Z. Install regulator vent piping for size of connection and extend to the exterior.

### 3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

### 3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- D. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

### 3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
  3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

### 3.8 CONNECTIONS

- A. Connect to utility's gas meter assembly according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### 3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for piping and valve identification.

### 3.10 PAINTING

- A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior natural-gas piping.

- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
  - 1. Alkyd System: MPI EXT 5.1D.
    - a. Prime Coat: Alkyd anticorrosive metal primer.
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    - c. Topcoat: Exterior alkyd enamel (semigloss).
    - d. Color: Gray.
- C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

### 3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.12 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be one of the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Branch Piping in Cast-in-Place Concrete: Shall not be permitted.

### 3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

- A. Aboveground, branch piping NPS 1 and smaller shall be the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.
- C. Underground, below building, piping shall be the following:
  - 1. Shall not be permitted.



3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for service meter shall be one of the following:
  - 1. Cast-iron, lubricated plug valve.
- B. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:
  - 1. Two-piece, full-port, bronze ball valves with bronze trim.
  - 2. Bronze plug valve.
- C. Valves in branch piping for single appliance shall be one of the following:
  - 1. Two-piece, full-port, bronze ball valves with bronze trim.
  - 2. Bronze plug valve.

END OF SECTION 221114

## SECTION 221116 - DOMESTIC WATER PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

### PART 2 - PRODUCTS

#### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61.

#### 2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
  - 1. MSS SP-123.
  - 2. Cast-copper-alloy, hexagonal-stock body.

3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

### 2.3 PEX TUBE AND FITTINGS

- A. PEX Distribution System: ASTM F 877, SDR 9 tubing.
- B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

### 2.4 PEX-AL-HDPE TUBE AND FITTINGS

- A. PEX-AL-HDPE Distribution System: ASTM F 1986 tubing.
- B. Fittings for PEX-AL-HDPE Tube: ASTM F 1986, metal-insert type with copper or stainless-steel crimp ring and matching PEX-AL-HDPE tube dimensions.

### 2.5 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
  1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
  2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

### 2.6 TRANSITION FITTINGS

- A. General Requirements:
  1. Same size as pipes to be joined.
  2. Pressure rating at least equal to pipes to be joined.
  3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

## 2.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
    - b. Matco-Norca.
    - c. McDonald, A. Y. Mfg. Co.
    - d. Watts; a division of Watts Water Technologies, Inc.
    - e. Wilkins; a Zurn company.
  - 2. Standard: ASSE 1079.
  - 3. Pressure Rating: 125 psig minimum at 180 deg F.
  - 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
    - b. Matco-Norca.
    - c. Watts; a division of Watts Water Technologies, Inc.
    - d. Wilkins; a Zurn company.
  - 2. Standard: ASSE 1079.
  - 3. Factory-fabricated, bolted, companion-flange assembly.
  - 4. Pressure Rating: 125 psig minimum at 180 deg F.
  - 5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Pipeline Seal and Insulator, Inc.
  - 2. Nonconducting materials for field assembly of companion flanges.
  - 3. Pressure Rating: 150 psig.
  - 4. Gasket: Neoprene or phenolic.
  - 5. Bolt Sleeves: Phenolic or polyethylene.
  - 6. Washers: Phenolic with steel backing washers.

## E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Grinnell Mechanical Products; Tyco Fire Products LP.
  - b. Matco-Norca.
  - c. Precision Plumbing Products, Inc.
  - d. Victaulic Company.
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

## PART 3 - EXECUTION

## 3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- F. Install domestic water piping level without pitch and plumb.
- G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

- J. Install piping to permit valve servicing.
- K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.
- N. PEX piping will ONLY be allowed in the horizontal direction within walls to fixtures. NO vertical PEX between floors will be allowed.
- O. Install PEX piping with loop at each change of direction of more than 90 degrees.
- P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- Q. Install pressure gages on suction and discharge piping for each plumbing pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- R. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."
- S. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

- E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. Joints for PEX Piping: Join according to ASTM F 1807.
- G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.3 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.

### 3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings, nipples or unions.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  - 1. Vertical Piping: MSS Type 8 or 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs:
    - a. 15 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
  - 3. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

- G. Install hangers for vertical PEX piping every 48 inches.
- H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
  - 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  - 4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.
  - 5. Omit isolation valves on factory packaged equipment where integral with package.

### 3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Piping Inspections:
    - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.



- 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
  - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
  - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
  - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
  - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.9 ADJUSTING

- A. Perform the following adjustments before operation:
- 1. Close drain valves, hydrants, and hose bibbs.
  - 2. Open shutoff valves to fully open position.
  - 3. Open throttling valves to proper setting.
  - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a. Adjust calibrated balancing valves to flows indicated in hot-water-circulation return piping to provide hot-water flow in each branch.
  - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

### 3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
  2. PEX tube, NPS 1 and smaller; fittings for PEX tube; and crimped joints. PEX tube use limited to specific locations as noted on the drawings.
  3. PEX-AL-PEX tube, NPS 1 and smaller; fittings for PEX-AL-PEX tube; and crimped joints. PEX tube use limited to specific locations as noted on the drawings.

END OF SECTION 221116

## SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Strainers.
6. Drain valves.
7. Water-hammer arresters.

##### B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water piping systems.

#### 1.2 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.

#### 1.3 INFORMATIONAL SUBMITTALS

- ##### A. Field quality-control reports.

#### 1.4 CLOSEOUT SUBMITTALS

- ##### A. Operation and maintenance data.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- ##### A. Potable-water piping and components shall comply with NSF 61.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

## 2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze in mechanical or service spaces, Chrome plated in finished spaces.

- B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze in mechanical or service spaces, Chrome plated in finished spaces.

## 2.4 BACKFLOW PREVENTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Watts

- B. Intermediate Atmospheric-Vent Backflow Preventers:

1. Standard: ASSE 1012.
2. Operation: Continuous-pressure applications.
3. Size: NPS 3/4.
4. Body: Bronze.
5. End Connections: Union, solder joint.
6. Finish: Rough bronze in mechanical or service spaces, Chrome plated in finished spaces.

- C. Reduced-Pressure-Principle Backflow Preventers:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle third of flow range.
4. Size and performance: as indicated.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:

- a. Flood Control Valve 120V/1P/60HZ.
- b. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
- c. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
- d. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

D. Double-Check, Backflow-Prevention Assemblies:

- 1. Standard: ASSE 1015.
- 2. Operation: Continuous-pressure applications unless otherwise indicated.
- 3. Pressure Loss: 5 psig maximum, through middle third of flow range.
- 4. Size and performance: as indicated.
- 5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
- 6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
- 7. Configuration: Designed for horizontal, straight-through <or other flow configuration where shown and as permitted by local jurisdiction>.
- 8. Accessories:
  - a. Valves: NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
  - b. Valves: NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

## 2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cash Acme; a division of Reliance Worldwide Corporation.
  - b. Conbraco Industries, Inc.
  - c. Honeywell International Inc.
  - d. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
  - e. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
- 2. Standard: ASSE 1003.
- 3. Pressure Rating: Initial working pressure of 150 psig.
- 4. Size and performance: as indicated.
- 5. Body: Bronze with chrome-plated finish where exposed in finished spaces for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
- 6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

## 2.6 BALANCING VALVES

A. Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Armstrong Pumps, Inc.
  - b. Bell & Gossett Domestic Pump.
  - c. Taco.
  - d. Tour & Andersson; available through Victaulic Company.
2. Body: Lead Free Brass, ball type with calibrated orifice or venturi.
3. Ball: stainless steel.
4. Seat: PTFE.
5. Seals: EPDM.
6. End Connections: Threaded or solder.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter with EPT check valves.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig (860 kPa).
10. Maximum Operating Temperature: 250 deg F (121 deg C).

## 2.7 STRAINERS FOR DOMESTIC WATER PIPING

### A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
  - a. Strainers NPS 2 and Smaller: 0.033 inch.
  - b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
6. Drain: Factory-installed, hose-end drain valve.

## 2.8 DRAIN VALVES

### A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

## 2.9 WATER-HAMMER ARRESTERS

### A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by:
  - a. Sioux Chief Manufacturing Company, Inc.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Hydra-Rester.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
  1. Locate backflow preventers in same room as connected equipment or system.
  2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
  3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve solenoid valve and pump.
- E. Install water-hammer arresters in water piping according to PDI-WH 201.

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer double-check, backflow-prevention assembly and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

- C. Prepare test and inspection reports.

### 3.3 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.

END OF SECTION 221119



## SECTION 221123 - DOMESTIC WATER PUMPS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Horizontally mounted, in-line, close-coupled centrifugal pumps.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.3 CLOSEOUT SUBMITTALS

- A. 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. UL Compliance: Comply with UL 778 for motor-operated water pumps.

### PART 2 - PRODUCTS

#### 2.1 HORIZONTALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong Pumps Inc.
  2. Bell & Gossett Domestic Pump; ITT Corporation.
  3. Grundfos Pumps Corporation, U.S.A.
- B. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal.
- C. Pump Construction:

1. Casing: Lead free bronze or stainless steel, radially split with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
  2. Impeller: Lead free brass or stainless steel, statically and dynamically balanced, closed, and keyed to shaft.
  3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
  4. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
  5. Bearings: Oil-lubricated; bronze-journal or ball type.
  6. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
- D. Motor: Single speed, with grease-lubricated bronze sleeve or ball bearings; and resiliently or rigidly mounted to pump casing.
- E. Capacities and Characteristics:
1. Capacity and operating characteristics: As indicated on drawings.
  2. Minimum Working Pressure: 125 psig.
  3. Maximum Continuous Operating Temperature: 225 deg F.
  4. Pump Control: Thermostat.

## 2.2 CONTROLS

- A. Thermostats: Electric; adjustable for control of hot-water circulation pump.
1. Type: Water-immersion temperature sensor, for installation in piping.
  2. Range: 50 to 125 deg F (10 to 52 deg C).
  3. Enclosure: NEMA 250, Type 4X
  4. Operation of Pump: On or off.
  5. Transformer: Provide if required.
  6. Power Requirement: 24 V, ac.
  7. Settings: Start pump at 105 deg F (41 deg C) and stop pump at 120 deg F (49 deg C).

## PART 3 - EXECUTION

### 3.1 PUMP INSTALLATION

- A. Comply with HI 1.4.
- B. Install horizontally mounted, in-line, close-coupled centrifugal pumps with shaft horizontal.
- C. Install continuous-thread hanger rods and of size required to support pump weight.
1. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- D. Install thermostats in hot-water return piping.

### 3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps to allow service and maintenance.
- C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
  - 1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:
    - a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
    - b. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."
  - 2. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 220523 "General –Duty Valves for Plumbing Piping and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."
  - 3. Install pressure gage and snubber at suction of each pump and pressure gage and snubber at discharge of each pump. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- D. Connect thermostats to pumps that they control.

### 3.3 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Check piping connections for tightness.
  - 3. Set thermostats for automatic starting and stopping operation of pumps.
  - 4. Perform the following startup checks for each pump before starting:
    - a. Verify bearing lubrication.
    - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    - c. Verify that pump is rotating in the correct direction.
  - 5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
  - 6. Start motor.
  - 7. Open discharge valve slowly.
  - 8. Adjust temperature settings on thermostats.

### 3.4 ADJUSTING

- A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust initial temperature set points.
- C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 221123

## SECTION 221316 - SANITARY WASTE AND VENT PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.3 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

### PART 2 - PRODUCTS

#### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

#### 2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Class 500.
- B. Gaskets: ASTM C 564, rubber.

#### 2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ANACO-Husky.
    - b. Fernco Inc.

- c. MIFAB, Inc.
  - d. Mission Rubber Company; a division of MCP Industries, Inc.
  - e. Stant.
  - f. Tyler Pipe.
- 2. Standards: ASTM C 1277 and CISPI 310.
  - 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ANACO-Husky.
    - b. MIFAB, Inc.
    - c. Mission Rubber Company; a division of MCP Industries, Inc.
    - d. Stant.
    - e. Tyler Pipe.
  - 2. Standards: ASTM C 1277 and ASTM C 1540.
  - 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

## 2.4 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
  - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solvent Cement: ASTM D 2564.
  - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.5 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Shielded, Nonpressure Transition Couplings:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Cascade Waterworks Mfg. Co.
    - 2) Fernco, Inc.
    - 3) Mission Rubber Company; a division of MCP Industries, Inc.
  - b. Standard: ASTM C 1460.
  - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

### PART 3 - EXECUTION

#### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

#### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.

- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
  - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- L. Plumbing Specialties:
  - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
  - 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."
- Q. Install aboveground PVC piping according to ASTM D 2665. Plastic piping may NOT be used in plenums utilized for air movement.



- R. Install underground PVC piping according to ASTM D 2321.

### 3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- D. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

### 3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in OD's.
  - 2. In Drainage Piping: Shielded, nonpressure transition couplings.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  - 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 4. Install individual, straight, horizontal piping runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
  - 5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 6. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- C. Support vertical piping and tubing at base and at each floor.

- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  - 2. NPS 3: 60 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
  - 4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
  - 2. NPS 3: 48 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
- H. Install supports for vertical PVC piping every 48 inches.
- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
  - 5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
  - 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

- E. Make connections according to the following unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

### 3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
  - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 6. Prepare reports for tests and required corrective action.

### 3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

### 3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
  - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
  - 3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
  - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
  - 3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings. Retain "any of" option in first paragraph below to allow Contractor to retain piping materials from those retained.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
  - 1. Class 500, cast-iron bell and spigot soil piping; gaskets; and gasketed joints.
  - 2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

## SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Miscellaneous sanitary drainage piping specialties.
5. Flashing materials.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

#### 1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

### PART 2 - PRODUCTS

#### 2.1 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.
  - d. Tyler Pipe.
  - e. Watts Drainage Products.
  - f. Zurn Plumbing Products Group.
2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass or plastic plug.

6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company; Josam Div.
  - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - c. Tyler Pipe; Wade Div.
  - d. Watts Drainage Products Inc.
  - e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Where required by application.
7. Outlet Connection: Spigot.
8. Closure: Brass plug with tapered threads or Plastic plug.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company; Josam Div.
  - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - c. Tyler Pipe; Wade Div.
  - d. Watts Drainage Products Inc.
  - e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, stainless-steel cover plate with screw.

## 2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company; Josam Div.
  - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - c. Tyler Pipe; Wade Div.
  - d. Watts Drainage Products Inc.
  - e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Drains shall be as scheduled on drawings with all capacities, sizes, materials, options and characteristics as indicated. Provide with all accessories as required for a complete installation.

### 2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

#### A. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

### 2.4 FLASHING MATERIALS

#### A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

#### B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

#### C. Fasteners: Metal compatible with material and substrate being fastened.

#### D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

#### E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

### 2.5 ROOF FLASHING ASSEMBLIES

#### A. Roof Flashing Assemblies

1. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
  - a. Open-Top Vent Cap: Without cap.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
  - 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  - 1. Position floor drains for easy access and maintenance.
  - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii or as directed by architect:
    - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
  - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- F. Assemble open drain fittings and install with top of hub 2 inches above floor.
- G. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.



### 3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

### 3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
  - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
  - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
  - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
  - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

### 3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

## SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

## 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. Commercial, packaged, factory-fabricated and -assembled, gas-fired, high efficiency condensing domestic water heaters, trim and accessories for generating hot potable water.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
  - 1. Wiring Diagrams: For power, signal, and control wiring.

## 1.4 SUBMITTALS

- A. Product Data: Include performance data, operating characteristics, furnished specialties and accessories.
  - 1. Prior to flue vent installation, engineered calculations and drawings must be submitted to Architect/Engineer to thoroughly demonstrate that size and configuration conform to recommended size, length and footprint for each submitted water heater.
- B. Efficiency Curves: At a minimum, submit efficiency curves for 100%, 80%, 60%, 40%, 20% and the lowest input firing rates at incoming water temperatures ranging from 70°F to 140°F. Test protocols shall conform to AERCO's AE-1 standard
- C. Pressure Drop Curve: Submit pressure drop curve for flows ranging from 0 GPM to maximum value of water heater.
- D. Shop Drawings: For water heaters, water heater trim and accessories, include:
  - 1. Plans, elevations, sections, details and attachments to other work
  - 2. Wiring Diagrams for power, signal and control wiring

- E. Source Quality Control Test Reports: Reports shall be included in submittals.
- F. Field Quality Control Test Reports: Reports shall be included in submittals.
- G. Operation and Maintenance Data: Data to be included in water heater emergency, operation and maintenance manuals.
- H. Warranty: Standard warranty specified in this Section.
- I. Other Informational Submittals.
  - 1. ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to water heater.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices and Accessories: Condensing water heaters must be 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. Performance Compliance: Condensing water heaters must be rated in accordance with ASHRAE 118.1 testing methods and verified by UL or AHRI as capable of achieving the energy efficiency and performance ratings as tested within prescribed tolerances.
- C. ASME Compliance: Condensing water heaters must be constructed in accordance with ASME Water heater and Pressure Vessel Code, Section IV (HLW) Potable Water Heaters.
- D. ASHRAE/IESNA 90.1 Compliance: Condensing water heaters shall have minimum efficiency according to "Gas and Oil Fired water heaters - Minimum Efficiency Requirements," when tested in accordance with Section G.1 "Method of Test for Measuring Thermal Efficiency" and G.2 "Method of Test for Measuring Standby Loss" of ANSI Z21.10.3
- E. UL Compliance. Condensing water heaters must be tested for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Condensing water heaters shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.
- F. NOx Emission Standards. When installed and operated in accordance with manufacturer's instructions, condensing water heaters shall comply with the NOx emission standards outlined in South Coast Air Quality Management District (SCAQMD), Rule 1146.2; and the Texas Commission on Environmental Quality (TCEQ), Title 30, Chapter 117, Rule 117.465.
- G. Low Lead Compliance: Condensing water heaters must be third party classified to meet the requirements of ANSI/NSF 372, hence that the weighted average of the wetted surface area in contact with potable water must be no greater than 0.25% lead content.

#### 1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement and formwork requirements are specified in Division 03.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including storage tank and supports.
    - b. Faulty operation of controls.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
  2. Warranty Periods: From date of Substantial Completion.
    - a. Commercial, Fire Tube, Gas-Fired, Condensing Domestic-Water Heaters:
      - 1) The pressure vessel shall carry a 10 year from shipment, non-prorated, limited warranty against any failure due to waterside corrosion, mechanical defects, or workmanship. The heat exchanger shall carry a 10 year from shipment, prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects, or workmanship.
      - 2) Manufacturer labeled control panels are conditionally warranted against failure for two (2) years from shipment.
      - 3) All other components, with the exception of the igniter and flame detector, are conditionally guaranteed against any failure for 18 months from shipment.
      - 4) Separate Hot-Water Storage Tanks: Five years.

## PART 2 - PRODUCTS

### 2.1 COMMERCIAL, FINNED-TUBE, GAS-FIRED, DOMESTIC-WATER HEATERS

- A. Commercial, Fire Tube, Gas-Fired, Condensing Domestic-Water Heaters:
1. Manufacturers: Subject to compliance with requirements, provide products by the following or acceptable equal:
    - a. Aereco
  2. Standard: ANSI Z21.13/CSA 4.9 for hot-water-supply boilers.
  3. Description: Packaged unit with boiler, separate hot-water storage tank, pump, piping, and controls.
- B. Capacity and Characteristics:
1. Capacity and Operating Characteristics as indicated on drawings.

## 2.2 CONSTRUCTION

- A. Description: Water heater shall be direct fired, fully condensing, fire-tube design. Power burner shall have full modulation. The minimum firing rate shall not exceed 50,000 BTU/HR input. Water heaters that have an input greater than 50,000 BTU/Hr at minimum fire will not be considered equal. The water heater shall have the capability of discharging into a positive pressure vent. Water heater thermal efficiency shall increase with decreasing load (output), while maintaining setpoint. Water heater shall have an operational setpoint capability of 50 °F to 190 °F and shall maintain the outlet temperature within an accuracy of +/- 4 °F during load changes of up to 50% rated capacity. Heater shall operate quietly, less than 55 dba. Water heater shall be factory-fabricated, factory-assembled and factory-tested, fire-tube condensing water heater with heat exchanger sealed pressure-tight, built on a steel base, including a sealed insulated sheet metal enclosure that acts as combustion-air intake plenum, flue-gas vent, water supply, return and condensate drain connections, and controls. Each water heater shall have an ASME approved temperature/pressure relief valve with a setting of 150 psig and 210 °F.
- B. Heat Exchanger: The heat exchanger shall be constructed with 316L or 439 stainless steel helical fire tubes, combustion chamber and dished tubesheet, with a two-pass combustion gas flow design. The heat exchanger shall be electroless nickel plated. The fire tubes shall be 3/4" OD, with no less than 0.035" wall thickness. The upper and lower stainless steel tubesheet shall be no less than 0.625" thick. The heat exchanger shall be welded and brazed construction. The heat exchanger shall be ASME Sect IV (HLW) stamped for a working pressure not less than 160 psig.
- C. Shell Assembly Pressure Vessel: The shell assembly pressure vessel shall have a maximum water volume of 26 gallons. The water heater water pressure drop shall not exceed 2 psig at 30 gpm. The water heater water connections shall be 2-inch NPT male connections. The shell assembly pressure vessel shall be constructed of 304 stainless steel of 0.25-inch wall thickness. The shell assembly pressure vessel shall be electroless nickel plated. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The shell assembly pressure vessel shall be ASME Sect IV (HLW) stamped for a working pressure not less than 160 psig.
- D. Modulating Air/Fuel Valve and Burner: The water heater burner shall be capable of a 24-to-1(INN1060) turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. The burner shall produce less than 20 ppm of NO<sub>x</sub> corrected to 3% excess oxygen. The unit shall be certified by the South Coast Air Quality Management District (SCAQMD) as compliant with Rule 1146.2 for water heaters and water heaters less than or equal to 2 MBTUs, and the Texas Commission on Environmental Quality (TCEQ) as being compliant with Section 117.465 for water heaters and water heaters less than or equal to 2 MBTUs. The burner shall be metal-fiber mesh covering a stainless steel body with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input. The modulating motor must be linked to both the gas valve body and air valve body with a single linkage. The linkage shall not require any field adjustment. A variable frequency drive (VFD), controlled cast aluminum pre-mix blower shall be used to ensure the optimum mixing of air and fuel between the air/fuel valve and the burner.
- E. Minimum water heater efficiencies shall be as follows at a 70 degree delta-T:

EWT	100% Fire	80% Fire	60% Fire	40% Fire	20% Fire	<10% Fire
70 °F	96%	97%	97.5%	98%	98.5%	99%

- F. The exhaust manifold shall be of corrosion resistant cast aluminum with a 6-inch diameter flue connection. The exhaust manifold shall have a collecting reservoir and a gravity drain for the elimination of condensation.
- G. Blower. The water heater shall include a variable-speed, DC centrifugal fan to operate during the burner firing sequence and pre-purge the combustion chamber.
  - 1. Motors: Blower motors shall comply with requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
    - a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require a motor to operate in the service factor range above 1.0.
- H. Ignition: Ignition shall be via spark ignition with 100 percent main-valve shutoff and electronic flame supervision.

2.3 CONTROLS

- A. The water heater control system shall be segregated into three components: “C-More” Control Panel, Power Box and Input/Output Connection Box. The entire system shall be Underwriters Laboratories recognized.
- B. The control panel shall consist of six individual circuit boards using state-of-the-art surface-mount technology in a single enclosure. These circuit boards shall include:
  - 1. A display board incorporating LED display to indicate temperature and a vacuum fluorescent display module for all message enunciation
  - 2. A CPU board housing all control functions
  - 3. An electric low-water cutoff board with test and manual reset functions
  - 4. A power supply board
  - 5. An ignition /stepper board incorporating flame safeguard control
  - 6. A connector board

Each board shall be individually field replaceable.

- C. The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.
- D. The control panel hardware shall support both RS-232 and RS-485 remote communications.
- E. The controls shall annunciate water heater and sensor status and include extensive self-diagnostic capabilities that incorporate a minimum of eight separate status messages and 34 separate fault messages.

- F. The control panel shall incorporate three self-governing features designed to enhance operation in modes where it receives an external control signal by eliminating nuisance faults due to over-temperature, improper external signal or loss of external signal. These features include:
1. Setpoint High Limit: Setpoint high limit allows for a selectable maximum water heater outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a PID function that automatically limits firing rate to maintain outlet temperature within a 0 to 10 degree selectable band from the desired maximum water heater outlet temperature.
  2. Setpoint Low Limit: Setpoint low limit allows for a selectable minimum operating temperature.
  3. Failsafe Mode: Failsafe mode allows the water heater to switch its mode to operate from an internal setpoint if its external control signal is lost, rather than shut off. This is a selectable mode, enabling the control can to shut off the unit upon loss of external signal, if so desired.
- G. The water heater control system shall incorporate the following additional features for enhanced external system interface:
1. System start temperature feature
  2. Pump delay timer
  3. Auxiliary start delay timer
  4. Auxiliary temperature sensor
  5. Analog output feature to enable simple monitoring of temperature setpoint, outlet temperature or fire rate
  6. Remote interlock circuit
  7. Delayed interlock circuit
  8. Fault relay for remote fault alarm
- H. Water Heater Management: the water heater control system shall incorporate onboard multi-unit sequencing logic that would allow lead-lag functionality & sequencing between multiple water heaters operating in parallel and must have the following capabilities:
1. Efficiently sequence 2 up to 8 units on the same system to meet the load requirement.
  2. Individual unit feed-forward logic will still be enabled for accurate temperature control equal to individual unit's specification.
  3. Operate one motorized valve per unit as an element of the load sequencing, Valves shall close with decreased load as heaters turn off, minimum of one (quantity must be selectable) must always stay open for recirculation.
  4. Automatically rotate lead/lag amongst the units on the chain and monitor run hours per unit and balance load in an effort to equalize unit run hours.
  5. Automatic bump-less transfer of master function to next unit on the chain in case of designated master unit failure; master/slave status should be shown on the individual unit displays.
  6. Units will default to individual control upon failure of the communications chain.
  7. Night temperature setback.
  8. Designated master control, used to display and adjust key system parameters.
- I. Each water heater shall be supplied with a factory packaged and pre-wired motorized ball valve. This valve shall be controlled by the water heater control system as an element of the onboard water heater management.

- J. Each water heater shall include an electric, single-seated combination safety shutoff valve/regulator with proof of closure switch in its gas train. Each water heater shall incorporate dual over-temperature protection with manual reset, in accordance with ASME Section IV and CSD-1.

## 2.4 ELECTRICAL POWER

- A. Controllers, Electrical Devices and Wiring: Electrical devices and connections are specified in Division 26 sections.
- B. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers and other electrical devices shall provide a single-point field power connection to the water heater.
- C. Electrical Characteristics:
  - 1. Voltage: 120 V
  - 2. Phase: Single
  - 3. Frequency: 60 Hz
  - 4. Full-Load Current 9 Amps

## 2.5 CONDENSATE

- A. Low-profile condensate neutralizing tubes. Each tube shall be suitable for no less than 12 months continuous operation at full condensing rate. Tubes shall be refillable;
- B. Condensate traps, manufactured from only non-corrosive materials. In order to guarantee flue gasses cannot leak into the boiler room, the traps shall be float-type traps NO EXCEPTIONS.

## 2.6 VENTING

- A. The exhaust vent must be UL Listed for use with Category II, III and IV appliances and compatible with positive pressure, condensing flue gas service. UL- listed vents of A1 29-4C stainless steel shall be used with water heaters for this project.
- B. The minimum exhaust vent duct size for each water heater is six-inch diameter.
- C. Combustion-Air Intake: Water heaters shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the water heater and the outdoors.
- D. The minimum sealed combustion air duct size for each water heater is six-inch diameter.
- E. Common Vent and Common Combustion Air must be an available option for water heater installation. Consult manufacturer for common vent and combustion air sizing.
- F. Follow guidelines specified in manufacturer's venting guide.



## 2.7 SOURCE QUALITY CONTROL

- A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions and carbon monoxide in flue gas, and to achieve combustion efficiency. Perform hydrostatic testing.
- B. Test and inspect factory-assembled water heaters, before shipping, according to ASME Boiler and Pressure Vessel Code.
  - 1. If water heaters are not factory assembled and fire-tested, the local vendor is responsible for all field assembly and testing.
- C. Allow Owner access to source quality-control testing of water heaters. Notify Architect fourteen days in advance of testing.

## 2.8 DOMESTIC-WATER HEATER ACCESSORIES

- A. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.
- C. Heat-Trap Fittings: ASHRAE 90.2.
- D. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball or butterfly shutoff valves to isolate each domestic-water heater and calibrated balancing valves to provide balanced flow through each domestic-water heater tank.
- E. Comply with requirements for ball or butterfly shutoff valves specified in Section 220523 "General Duty Valves for Plumbing Piping."
  - 1. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.
- G. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 1/2-psig pressure rating as required to match gas supply.
- H. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
- I. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
  - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

- J. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.
  - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- K. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

## 2.9 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect assembled domestic-water heaters and storage tanks specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters and storage tanks to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and re-inspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Before water heater installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations. Examine piping and electrical connections to verify actual locations, sizes and other conditions affecting water heater performance, maintenance and operations.
  - 1. Final water heater locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Examine mechanical spaces for suitable conditions where water heaters will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete" or Section 033053 "Miscellaneous Cast-in-Place Concrete."
  - 1. Maintain manufacturer's recommended clearances.
  - 2. Arrange units so controls and devices that require servicing are accessible.
  - 3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  6. Install anchor bolts to elevations required for proper attachment to supported equipment.
  7. Anchor domestic-water heaters to substrate.
- B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General Duty Valves for Plumbing Piping."
- C. Install gas-fired, domestic-water heaters according to NFPA 54.
1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
  2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
  3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
  4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 221114 "Facility Natural-Gas Piping."
- D. Install combination temperature-and-pressure relief valves or pressure relief valves as required by manufacturer's system in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- G. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Section 220523 "General Duty Valves for Plumbing Piping."
- H. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
- I. Fill domestic-water heaters with water.

- J. Charge domestic-water compression tanks with air.

### 3.3 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Section 221114 "Facility Natural-Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.
- E. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.
- F. Connect gas piping to water heater gas-train inlet with unions. Piping shall be at least full size of gas train connection. Provide a reducer if required.
- G. Connect hot-water piping to supply and return water heater tappings with shutoff valve and union or flange at each connection.
- H. Multiple heaters shall be piped in reverse return or provided with balancing valves on hot water outlet. Each water heater shall have individual isolation valves for servicing and a hot water hose connection for start-up and field testing.
- I. Install piping from safety relief valves to nearest floor drain.
- J. Water heater Venting
  - 1. Install flue venting kit and combustion-air intake.
  - 2. Connect venting full size to water heater connections.
- K. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- L. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.4 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
  2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
  4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  5. Controls and Safeties: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
    - a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
    - b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.
- F. Performance Tests

The water heater manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three separate curves at various BTU input levels. If these curves are not available, it is the responsibility of the water heater manufacturer to complete the following performance tests:

1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
2. Water heaters shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
3. Perform field performance tests to determine capacity and efficiency of water heaters.
  - a. Test for full capacity.
  - b. Test for water heater efficiency at low fire, 20, 40, 60, 80, and 100 percent of full capacity. Determine efficiency at each test point.

4. Repeat tests until results comply with requirements indicated.
5. Provide analysis equipment required to determine performance.
6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.
7. Notify Architect in advance of test dates.
8. Document test results in a report and submit to Architect.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

END OF SECTION 223400

## SECTION 224000 - PLUMBING FIXTURES

### 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. This Section includes plumbing fixtures and related components.
- B. Related Sections include the following:
  - 1. Division 22 Section "Domestic Water Piping Specialties" for specialty fixtures not in this Section.

#### 1.3 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

#### 1.4 SUBMITTALS

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. 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.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.
- E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
  1. Hand Sinks: NSF 2 construction.
  2. Vitreous-China Fixtures: ASME A112.19.2M.
  3. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
- I. Comply with the following applicable standards and other requirements specified for faucets, fittings and valves:
  1. Faucets: ASME A112.18.1M.
  2. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
  3. NSF Potable-Water Materials: NSF 61.
  4. Pipe Threads: ASME B1.20.1.
  5. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
  6. Supply Fittings: ASME A112.18.1.
  7. Brass Waste Fittings: ASME A112.18.2.
  8. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
  9. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
  10. Hand-Held Showers: ASSE 1014.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  1. Off-floor fixture supports: ASME A112.6.1M
  2. Plastic toilet seats: ANSI Z124.5



- 3. Supply and drain protective shielding guards: ICC A 117.1.
- 4. Disposers: ASSE 1008 and UL 430.

1.6 COORDINATION

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fixtures, equipment and accessories are specified by manufacturer's numbers as to the type and quality required. Specified manufacturers and approved equal manufacturers are as follows:

FIXTURE, ITEM OR EQUIPMENT	SPECIFIED MANUFACTURER	APPROVED EQUAL MANUFACTURER
Vitreous China Fixtures	American Standard Kohler	Toto
Stainless Steel Sinks	Elkay	Just Kohler
Service Sinks	Stern-Williams	Fiat
Supply Faucets & Trim	Chicago Faucets Kohler Grohe	T & S Brass Sloan
Shower Mixing Valves	Symmons	Leonard Speakman
Flush Valves	Sloan	Zurn Toto
Water Closet Seats	Church	Beneke Olsonite Toto
Carriers	J R Smith	Josam Wade Watts Zurn
Water Fountains and Coolers	Elkay	Halsey Taylor
Waste Fittings	McGuire	Dearborn Brass

		ProFlo Jones Stephens
Stops & Supplies	BrassCraft	McGuire ProFlo Watts Jones Stephens
Hydrants	Woodford	J R Smith Josam Zurn
Valve and Waste Boxes	Sioux Chief	IPS Corp Oatey
Under Sink Pipe Covers	Trubro	ProFlo Plumberex
Drains	J R Smith	Josam Wade Watts
Trench Drains	J R Smith	Josam Wade Watts Zurn Zurn

## 2.2 PLUMBING FIXTURES

### "WC-1" Water Closet, Wall Mounted Flush Valve, Low Flow (ADA compliant)

American-Standard 3351.001 "FloWise" white vitreous china, high efficiency, direct fed siphon jet action, elongated bowl, wall hung, 1-1/2" top spud.

Flush Valve:

Sloan "Ecos" 8111-1.6/1.1 (1.6/1.1 gpf) battery operated electronic dual flush diaphragm flush valve with manual release, vacuum breaker and angle stop.

Accessories: Church 9500SSC white open front seat less cover with self sustaining check hinges, and J. R. Smith water closet support.

Note: Mount fixture rim 17" above finished floor and flush valve to wide side of fixture.

### "WC-2" Water Closet, Wall Mounted Flush Valve, Low Flow

American-Standard 3351.001 "Afwall FloWise" white vitreous china, high efficiency, direct fed siphon jet action, elongated bowl, wall hung, 1-1/2" top spud.

Flush Valve:

Sloan "Ecos" 8111-1.6/1.1 (1.6/1.1 gpf) battery operated electronic dual flush diaphragm flush valve with manual release, vacuum breaker and angle stop.

Accessories: Church 9500SSC white open front seat less cover with self sustaining check hinges, and J. R. Smith water closet support.

Note: Mount fixture rim 15" above finished floor.

"WC-3" Water Closet, Floor Mounted Flush Valve, Low Flow (ADA compliant)

American-Standard 3043.001 "Madera FloWise" white vitreous china, high efficiency, direct fed siphon jet action, fully glazed 2" trap way, elongated bowl, with 1-1/2" top spud, 16-1/2" rim height.

Flush Valve:

Sloan "Ecos" 8111-1.6/1.1 (1.6/1.1 gpf) battery operated electronic dual flush diaphragm flush valve with manual release, vacuum breaker and angle stop.

Accessories: Church 9500SSC white open front seat less cover with self sustaining check hinges, and J. R. Smith water closet support.

Note: Mount fixture rim 17" above finished floor and flush valve to wide side of fixture.

"U-1" Urinal Low Flow

American-Standard 6590.001 "Washbrook" white vitreous china, wall-hung, high efficiency washout flush action, integral flushing rim, 3/4" top spud, 2" outlet.

Flush Valve: Sloan 8186-1.0 (1.0 gpf) battery operated electronic flush valve with manual release, vacuum breaker and angle stop.

Accessories: J. R. Smith urinal support.

Note: Mount fixture rim 24" above finished floor.

"U-2" Urinal Low Flow (ADA compliant)

American-Standard 6590.001 "Washbrook" white vitreous china, wall-hung, high efficiency washout flush action, integral flushing rim, 3/4" top spud, 2" outlet.

Flush Valve: Sloan 8186-1.0 (1.0 gpf) battery operated electronic flush valve with manual release, vacuum breaker and angle stop.

Accessories: J. R. Smith urinal support.

Note: Mount fixture rim 17" above finished floor.

"L-1" Sink, Wall Hung

Elkay model EWMA9620SACTMC wall hung multiple station hand wash sink kit, 304 SST, buffed satin finish, 14 fa., single bowl, sink dimension 96" x 20" x 25-3/4", bowl dimension 93" x 16-1/2" x 8", integral back.

Faucet: four (4) model LKB722C sensor faucets – AC/battery, four (4) LK723 thermostatic mixing valves

Accessories: Provide LK18B grid drain, semi-cast brass p-trap with cleanout, chrome-plated risers with loose key angle stops and J.R. Smith concealed arm lavatory support. Provide with fully molded flexible vinyl insulation kit cover trap, supplies and stops, Trubro E-Z LAV GUARD.

Note: Mounting height per Architectural drawings.

"L-2" Sink, Wall Hung

Elkay model EWMA4820SACTMC wall hung multiple station hand wash sink kit, 304 SST, buffed satin finish, 14 fa., single bowl, sink dimension 48" x 20" x 18", bowl dimension 45" x 16-1/2" x 8", integral back.

Faucet: two (2) model LKB722C sensor faucets – AC/battery, two (2) LK723 thermostatic mixing valves

Accessories: Provide LK18B grid drain, semi-cast brass p-trap with cleanout, chrome-plated risers with loose key angle stops and J.R. Smith concealed arm lavatory support. Provide with fully molded flexible vinyl insulation kit cover trap, supplies and stops, Trubro E-Z LAV GUARD.

Note: Mounting height per Architectural drawings.

- "L-3" Lavatory, Wall Hung (ADA Compliant)  
 American-Standard 0356.421 (center hole only) "Lucerne" Vitreous china, 20" x 18", front overflow, integral back.  
 Faucet: Chicago Faucets model 116.606.AB.1 deck mounted, single hole, single temperature ceramic disc battery operated electronic faucet with vandal resistant non-aerating outlet (0.5 gpm).  
 Accessories: Provide Leonard 170-LF lead free bronze thermostatic mixing valve with 0.25 gpm minimum flow rate, integral check valves, discharge set at 105 F, mounted downstream of fixture stops, with hot and cold water piped to valve, tempered water to lavatory. Chicago Faucets model 327-XCP grid drain, 1-1/4" x 1-1/2" 17 GA. semi-cast brass p-trap with cleanout, chrome-plated risers with loose key angle stops and J.R. Smith concealed arm lavatory support. Provide with fully molded flexible vinyl insulation kit cover trap, supplies and stops, Trubro E-Z LAV GUARD.  
 Note: Mount fixture rim 34" above finished floor.
- "S-1" Sink, Double Drop In (ADA Compliant)  
 Elkay LRAD-2918 double compartment self-rimming sink, 18 GA, type 304 stainless steel, 6-1/2" deep bowl.  
 Faucet:  
 Chicago Faucets model 786-LR9E35V317XKAB deck mounted faucet with ceramic operating cartridge, 4" wrist blade handles, 9-1/2" restricted swing spout with vandal resistant 1.5 gpm aerator.  
 Accessories: Elkay LK-35 strainers with 1-1/2" tailpiece, 1-1/2" 17 GA. semi-cast brass p-trap with cleanout, chrome-plated risers with loose key angle stops.
- "SH-1" Shower ADA  
 Shower by Others.  
 Valve: Symmons model 9605-PLR-1.5-X-CKS-IPS-B-D-QD shower unit with pressure balanced mixing valve with lever handle, limit stop and check/stops, shower head, arm and flange, chrome escutcheon/dome cover, quick disconnect on hand shower unit, 36" slide bar, 5 ft. hand held hose, adjustable stop screw, ADA hand shower. Mount fixed head at 7'-8" AFF or per Architectural drawings.
- "SH-2" Shower  
 Shower by Others.  
 Valve: Symmons model S9601-P-1.5-X-CHKS-IPS-B-D shower unit with pressure balanced mixing valve with lever handle, limit stop and check/stops, shower head, arm and flange, chrome escutcheon/dome cover. Mount fixed head at 7'-8" AFF or per Architectural drawings.
- "DF-1" Bi-level Drinking Fountain (ADA Compliant)  
 Elkay # EZ-STL8 wall mounted ADA barrier-free Bi-Level cooler, 8.0 G.P.H. (50° F water with 90° F air temperature), front push button, stainless steel cooler top, heavy gauge stainless steel shroud, Integral bottle filling station with filter.120V/1ph/60hz.  
 Accessories: McGuire LF2165CC angle stops with riser and escutcheon, 17 GA. semi-cast brass p-trap with cleanout, chrome-plated supply and stop, J.R. Smith floor mounted type support with "Pro-Set" uprights.  
 Note: Mount with lower level spout 35" above finish floor.
- "JS-1" Janitor Sink

Stern-Williams Cornaro model SBC-1400, size 24" x 24" x 12" Terrazzo service sink with cast brass drain, stainless steel strainer, 3" drain connection.

Faucet: Chicago Faucets model 897-CP with quatern operating cartridge, vacuum breaker spout with pail hook and wall brace, 3/4" male hose thread outlet, 369 lever handles, flanged adjustable supply arm and integral supply stops.

Accessories: V-70 extruded vinyl bumper guard, T-35 36" rubber hose with stainless steel wall bracket.

"FD-1" Floor Drain

J. R. Smith 2005YA-NB, round top or 20054B-NB, square top (in ceramic tile floors), duco cast iron body with flashing collar, adjustable strain head, outlet size per plans, nickel bronze strainer, seepage openings and trap primer connection.

"EFD-1" Equipment Floor Drain, Medium Capacity

J.R. Smith 2210Y medium duty DUCO cast iron body, sediment bucket and grate, no hub outlet. Provide with 3591 oval funnel where drain receives indirect waste.

"FS-1" Sanitary Floor Sink, Medium Capacity

J. R. Smith 3100Y light duty 8½"x8½" DUCO cast iron body, acid resistant coated interior, aluminum dome strainer, anchor flange, no hub outlet, nickel bronze grate. Provide ¾" top where drain receives indirect waste.

"TD-1" Trench Drain

J. R. Smith 9666BS threshold drain with vandal prof ADA SST inlay grating, , 18 ga. Type 304 SST body, 2" NO-HUB bottom outlet, flashing clamp, slotted grate, outlet size per plans.

"TD-2" Trench Drain

J. R. Smith 9930 Series Envir-Flo II drain system, 100% polypropylene, channle interlocking design with built-in slope of 0.6% with reaiused bottom. Supplied with secured grate model 9870-450-SS 3 ¼ x 3/8 slotted stainless steel grate, closing end cap shallow and 4" horizontal outlet.

"HB-1" Hose Bibb, Interior

Woodford 26 faucet, chrome plated brass, ¾" inlet and hose connection, mounting flange, integral ASSE double check backflow preventer, metal wheel handle.

"WH-1" Wall Hydrant, Exposed

Woodford 67 freezeless wall hydrant, chrome plated brass, ¾" inlet and hose connection, integral ASSE double check backflow preventer, loose key, stem length as required.

"IM-1" Ice Maker Wall Box

Sioux Chief 696 G1000 Series, recessed ice maker wall box with quarter turn valve and 1/2" inlet, ABS cover.

"WB-1" Ice Maker Wall Box

Sioux Chief -2313 Series recessed supply and drain wall boxes with quarter turn valves, mini shock arrestors, sweat water connections, 2" drain, ABS cover.

"EES" Emergency Free Standing Shower and Eye Wash (ADA Compliant)

Haws model 8309WC ADA accessible unit with galvanized steel stand with floor mounting flange, 1-1/4" water inlet and drain, shower with ABS shower head with 20 gpm flow control,

1" ball valve and pull rod, stainless steel eye wash bowl, ball valve and operator, wash head and dust cover and emergency signage.

Accessories: 1-1/4" water supply with wall escutcheon, 1-1/4" x 1-1/2" 17 GA. semi-cast brass P-trap with clean-out. Haws model 9201H Lead-free emergency thermostatic hot and cold water 31 gpm mixing valve.

**“WDF” Wash Down Faucet**

Faucet: Chicago Faucets model 897-CP with quatern operating cartridge, vacuum breaker spout with pail hook and wall brace, 3/4" male hose thread outlet, 369 lever handles, flanged adjustable supply arm and integral supply stops.

**“SI-1” Solids Interceptor**

Striem Model AA-S small basket style solids interceptor, 35 gpm, polyethylene, with removable corrosion resistant filter basket equipped with high and low outlet options, with a movable sewer gas trap to be located on either outlet. Cover shall be water and gas tight with a minimum 450 lbs load capacity or 2,500 lbs capacity when buried with riser, interceptor shall be in compliance with IAPMO IGC 167-2011ae2. Units shall have 2" schedule 40 plain end inlet and outlets, 2 gallon solids capacity, 2" sewer gas trap, 0.1" x 0.08" screen perforations.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 FIXTURE INSTALLATION

- A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  1. Position floor drains for easy access and maintenance.
  2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
  3. Set with grates depressed according to the following drainage area radii:
    - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
  4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

- a. Maintain integrity of waterproof membranes where penetrated.
- 5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- B. Install trench drains at low points of surface areas to be drained.
  - 1. Set grates of drains flush with finished surface, unless otherwise indicated.
- C. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- D. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
  - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
  - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
  - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- E. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
- F. Install wall-hanging fixtures with tubular waste piping attached to supports.
- G. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  - 1. Exception: Use ball valve if stops are not specified with fixture. Refer to Division 22 Section "General Duty Valves for Plumbing Piping" for general-duty valves.
- I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- K. Install toilet seats on water closets.
- L. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- M. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
- N. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- O. Install traps on fixture outlets.
  - 1. Exception: Omit trap on fixtures with integral traps.

2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

- P. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 22 Section "Common Work Results for Plumbing" for escutcheons.
- Q. Seal joints between fixtures and walls, using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water supplies from water distribution piping to fixtures.
- C. Connect drain piping from fixtures to drainage piping.
- D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

### 3.4 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

### 3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.



### 3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.

### 3.7 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.
- C. Provide protective covering for installed fixtures and fittings.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

## SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Sleeves.
2. Grout.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

## PART 2 - PRODUCTS

## 2.1 SLEEVES

- A. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- E. piping OD.

## 2.2 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. Install sleeves in concrete floors and concrete walls as new slabs and walls are constructed.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
  - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- C. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

### 3.2 SLEEVE SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  - 1. Exterior Walls above Grade:
    - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves or Galvanized-steel pipe sleeves.
  - 2. Interior Partitions:
    - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.
- B. PVC Sleeves may NOT be used in plenum spaces used for air movement.

END OF SECTION 230517

## SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Metal pipe hangers and supports.
  2. Trapeze pipe hangers.
  3. Thermal-hanger shield inserts.
  4. Equipment supports.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
  2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

#### 1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

#### A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

### 2.2 TRAPEZE PIPE HANGERS

- #### A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

### 2.3 THERMAL-HANGER SHIELD INSERTS

- #### A. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- #### B. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- #### C. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

### 2.4 EQUIPMENT SUPPORTS

- #### A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

### 2.5 MISCELLANEOUS MATERIALS

- #### A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- #### B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
  2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- F. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- K. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 40, protective shields on piping with vapor barrier. Shields shall span an arc of 180 degrees.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

### 3.2 EQUIPMENT SUPPORTS

- A. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- B. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099123 "Interior Painting"
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
- G. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Top Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
  2. C-Clamps (MSS Type 23): For structural shapes.
- H. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
- I. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- J. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.



END OF SECTION 230529

## SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Pipe labels.

#### 1.2 ACTION SUBMITTAL

- A. Product Data: For each type of product indicated.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Material and Thickness: Brass, 0.032-inch or Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  - 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
  - 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

#### 2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting"
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
  - 1. Refrigerant Piping:
    - a. Background Color: Yellow.
    - b. Letter Color: Black.

END OF SECTION 230553

## SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems

#### 1.2 ACTION SUBMITTALS

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

#### 1.4 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC or NEBB.
1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
  2. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.
- B. TAB Report Forms: Use standard NEBB or AABC Test and Balance Forms or forms adapted from NEBB or AABC forms that adhere to most restrictive practices pertaining to project.
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- E. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine the approved submittals for HVAC systems and equipment.
- C. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- D. Examine equipment performance data.
  - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- E. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- F. Examine test reports specified in individual system and equipment Sections.
- G. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- H. Examine operating safety interlocks and controls on HVAC equipment.
- I. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance"; NEBB's "Procedural Standards for

Testing, Adjusting, and Balancing of Environmental Systems"; SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

- B. Cut insulation, ducts, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
  - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230700 "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

#### 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- E. Verify that motor starters are equipped with properly sized thermal protection.
- F. Check dampers for proper position to achieve desired airflow path.
- G. Check for airflow blockages.
- H. Check condensate drains for proper connections and functioning.
- I. Check for proper sealing of air-handling-unit components.
- J. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

#### 3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.

- a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
  - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
  - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
  - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
2. Measure fan static pressures as follows:
    - a. Measure static pressure directly at the fan outlet or through the flexible connection.
    - b. Measure static pressure directly at the fan inlet or through the flexible connection.
    - c. Measure static pressure across each component that makes up the air-handling system.
    - d. Report artificial loading of filters at the time static pressures are measured.
  3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  4. Obtain approval from Architect/Engineer or commissioning authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
  2. Adjust submain and branch duct volume dampers for specified airflow.
  3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
  2. Measure inlets and outlets airflow.
  3. Adjust each inlet and outlet for specified airflow.
  4. Re-measure each inlet and outlet after they have been adjusted.
- ### 3.6 TOLERANCES
- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent.
  2. Air Outlets and Inlets: Plus or minus 10 percent.



- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

### 3.7 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
  - 2. Include a list of instruments used for procedures, along with proof of calibration.
  - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Fan curves.
  - 2. Manufacturers' test data.
  - 3. Field test reports prepared by system and equipment installers.
  - 4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
  - 1. Title page.
  - 2. Name and address of the TAB specialist.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB supervisor who certifies the report.
  - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  - 11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  - 12. Nomenclature sheets for each item of equipment.
  - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
  - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
  - 15. Test conditions for fans and pump performance forms including the following:
    - a. Settings for outdoor-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Face and bypass damper settings at coils.

- e. Fan drive settings including settings and percentage of maximum pitch diameter.
  - f. Settings for supply-air, static-pressure controller.
  - g. Other system operating conditions that affect performance.
- D. Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

- a. Unit identification.
- b. Location.
- c. Make and type.
- d. Model number and unit size.
- e. Manufacturer's serial number.
- f. Unit arrangement and class.
- g. Discharge arrangement.
- h. Sheave make, size in inches, and bore.
- i. Center-to-center dimensions of sheave and amount of adjustments in inches.
- j. Number, make, and size of belts.
- k. Number, type, and size of filters.

2. Motor Data:

- a. Motor make, and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.
- f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm.
- b. Total system static pressure in inches wg.
- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Filter static-pressure differential in inches wg.
- f. Preheat-coil static-pressure differential in inches wg.
- g. Cooling-coil static-pressure differential in inches wg.
- h. Heating-coil static-pressure differential in inches wg.
- i. Outdoor airflow in cfm.
- j. Return airflow in cfm.
- k. Outdoor-air damper position.
- l. Return-air damper position.

### 3.8 VERIFICATION OF TAB REPORT

- A. When requested, the TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect/Engineer or commissioning authority.

- B. Architect/Engineer or Commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
  - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
  - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
  - 3. If the second verification also fails, design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

### 3.9 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

## SECTION 230700 - HVAC INSULATION

### 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. This Section includes semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
  - 1. Division 23 Section "Hangers and Supports" for pipe insulation shields and protection saddles.
  - 2. Division 23 Section "Metal Ducts" for duct liner.

#### 1.3 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
- C. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

#### 1.6 COORDINATION

- A. Coordinate clearance requirements with duct Installer for insulation application.

#### 1.7 SCHEDULING

- A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Mineral-Fiber Insulation:
    - a. CertainTeed Manson.
    - b. Knauf FiberGlass GmbH.
    - c. Owens-Corning Fiberglas Corp.
    - d. Schuller International, Inc.
    - e. Johns Manville
  2. Flexible Elastomeric Thermal Insulation:
    - a. Armacell.
    - b. Rubatex Corp.

#### 2.2 INSULATION MATERIALS

- A. Mineral-Fiber Blanket Thermal Insulation: Maximum "K" factor of .25 @ 70° F. Glass fibers bonded with a thermosetting resin 1.5#/ft<sup>3</sup> density for use to 250° F. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film. Basis of design: Duct wrap by Certain-Teed.

- B. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials, ASTM C 534, Type II for sheet materials or self-seal elastomeric insulation. . With a maximum “k” factor of .25 at 70°F to 200°F. Basis of Design: Armacell AP Armaflex SS Insulation.
  - 1. Adhesive: As recommended by insulation material manufacturer.
  - 2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
  - 3. Self-seal elastomeric insulation may be used. (except for condensate drains.)
- C. Completely insulate piping system. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

### 2.3 STANDARD JACKET FOR INSULATION

- A. ASTM C 921, Type I, vapor barrier type. Provide jacket of laminated aluminum foil and kraft paper with a glass-fiber reinforcing scrim

### 2.4 FIELD-APPLIED JACKETS

- A. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B 209, and having an integrally bonded moisture barrier over entire surface in contact with insulation. 3003 alloy, H-14 Temper, roll stock ready for shop or field cutting and forming to required sizes. Minimum .01” thick.
  - 1. Finish: Smooth finish.
- B. Aluminum Jackets: Secure jackets according to jacket manufacturer's written instructions.

### 2.5 ACCESSORIES AND ATTACHMENTS

- A. Jacket Bands: In one of the following materials compatible with jacket:
  - 1. Aluminum 3003 alloy, ¾” wide.
- B. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd..
  - 1. Tape Width: 4 inches.
- C. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

### 2.6 VAPOR RETARDERS

- A. Moisture Barrier: 3-mil Dupont Surlyn

- B. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.
  - 1. Exterior Insulation (Metal Jacket): Flexible elastomeric based, vapor barrier sealant designed to seal metal joints, .02 perm max, -50 to 250 ° F, aluminum color.
  - 2. Interior Insulation: Water based fire resistive composition with a water permeance of .08 max. and temperature range of -20 to 180° F.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

#### 3.3 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply multiple layers of insulation with longitudinal and end seams staggered.
- E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- F. Keep insulation materials dry during application and finishing.
- G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- H. Apply insulation with the least number of joints practical.

- I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
  - J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
  - K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
  - L. Apply insulation with integral jackets as follows:
    - 1. Pull jacket tight and smooth.
    - 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
    - 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
  - M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
  - N. Install vapor-retarder mastic on insulation scheduled to receive vapor retarders.
    - 1. Insulation Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
    - 2. Insulation without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.
  - O. Insulation exposed to weather: Protect outdoor insulation from weather by installation of watertight aluminum (or stainless steel jacket). Seal all joints and seams with waterproof sealant.
  - P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- 3.4 MINERAL-FIBER INSULATION APPLICATION
- A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers with wrap facing out.
    - 1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
    - 2. Apply adhesive to entire circumference of ducts and pipes and to all surfaces of fittings and transitions.
    - 3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:



- a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
  - b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
  - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
  - d. Do not over compress insulation during installation.
  - e. On rectangular ducts, 24" and greater, insulation shall be secured to bottom of the duct with fasteners spaced 18" o.c. to prevent sagging.
4. Impale insulation over anchors and attach speed washers.
  5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
  7. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
  8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch-wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
  10. Apply vapor-retarder mastic or tape matching the insulation facing, to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.
  11. Cover piping with standard PVC jacket on all vertical piping within 8'-0" of floor when exposed to view.
  12. Cut insulation to "stretch out" dimensions as indicated by manufacturer.

### 3.5 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

#### A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

#### B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

- C. Apply insulation to fittings and elbows as follows:
  - 1. Apply mitered sections of pipe insulation.
  - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
  
- D. Apply insulation to valves and specialties as follows:
  - 1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
  - 2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
  - 3. Apply insulation to flanges as specified for flange insulation application.
  - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

### 3.6 FIELD-APPLIED JACKET APPLICATION

- A. Insulation Exposed to Weather: Protect outdoor insulation from weather by installing watertight metal jacket. Seal all joints and seams with weatherproof, waterproof sealant. Install jacket over ductwork insulation exposed to weather as follows:
  - 1. Encase insulation completely.
  - 2. Construct each section of jacket using one or two aluminum (or stainless steel sheets).
  - 3. Make seams at the bottom or sides of the duct, using mechanical fasteners. For round duct, bands are acceptable fasteners.
  - 4. Seal the seams with weatherproof sealant.
  - 5. Install successive sections with a minimum 1" overlap, fasten with mechanical fasteners, and seal with weatherproof sealant.

### 3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

### 3.8 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

### 3.9 FIELD QUALITY CONTROL

- A. Insulation applications will be considered defective if on site observation reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

### 3.10 DUCT SYSTEM APPLICATIONS

- A. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- B. Insulate the following plenums and duct systems:
  - 1. Indoor supply-, return-, and outside-air ductwork.
- C. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
  - 1. Fibrous-glass ducts.
  - 2. Metal ducts with duct liner.
  - 3. Factory-insulated flexible ducts.
  - 4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
  - 5. Flexible connectors.
  - 6. Vibration-control devices.
  - 7. Testing agency labels and stamps.
  - 8. Nameplates and data plates.
  - 9. Access panels and doors in air-distribution systems.

### 3.11 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE – Ductwork shall be as shown in the following table unless otherwise indicated.

- A. Supply air ductwork.
  - 1. Material: Fiberglass blanket wrap.
  - 2. Thickness: 2”.
  - 3. Vapor Retarder: Yes.
- B. Low velocity supply air ductwork to diffuser runouts.
  - 1. Material: Fiberglass blanket wrap.
  - 2. Thickness: 2”.
  - 3. Vapor Retarder: Yes.
- C. Outside air ductwork.
  - 1. Material: Fiberglass blanket wrap.
  - 2. Thickness: 2”.
- D. Return air ductwork

1. Material: Fiberglass blanket wrap.
2. Thickness: 1".
3. Vapor Retarder: Yes.

### 3.12 PIPING SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
  1. Flexible connectors.
  2. Vibration-control devices.
  3. Fire-suppression piping.
  4. Drainage piping located in crawl spaces, unless otherwise indicated.
  5. Below-grade piping, unless otherwise indicated.
  6. Chrome-plated pipes and fittings, unless potential for personnel injury or handicapped lavatories and sinks.
  7. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

### 3.13 INTERIOR PIPING INSULATION APPLICATION SCHEDULE

- A. Condensate drain piping. (indoors only)
  1. Insulation Material: Flexible elastomeric. (do not split)
  2. Insulation Thickness: ½".
- B. Refrigerant piping 1-1/4".
  1. Insulation Material: Flexible elastomeric.
  2. Insulation Thickness: 1/2".
- C. Refrigerant Piping 1-1/4".
  1. Insulation Material: Flexible elastomeric.
  2. Insulation Thickness: 1"

### 3.14 EXTERIOR PIPING INSULATION APPLICATION SCHEDULE

- A. This application schedule is for aboveground insulation outside the building.
- B. Protect outdoor insulation from weather by installing watertight aluminum (or stainless steel) jacket. Seal all joints and seams with weatherproof, waterproof sealant.
- C. Refrigerant Suction.
  1. Insulation Material: Flexible elastomeric.
  2. Insulation Thickness: 1".
  3. Field-Applied Jacket: Aluminum.

END OF SECTION 230700

SECTION 230800 - COMMISSIONING OF HVAC (UNDER SEPARATE CONTRACT WITH OWNER)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment that will be performed under separate contract with Owner.
- B. All coordination and support required for completion of Commissioning Services shall be provided.

1.3 DEFINITIONS

- A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- B. CxA: Commissioning Authority.
- C. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.
- D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 INFORMATIONAL SUBMITTALS

- A. Certificates of readiness.
- B. Certificates of completion of installation, prestart, and startup activities.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. Perform commissioning tests at the direction of the CxA.
- B. Attend construction phase controls coordination meeting.
- C. Attend testing, adjusting, and balancing review and coordination meeting.

- D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- E. Provide information requested by the CxA for final commissioning documentation.
- F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

#### 1.6 CxA'S RESPONSIBILITIES

- A. Provide Project-specific construction checklists and commissioning process test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.
- B. Direct commissioning testing.
- C. Verify testing, adjusting, and balancing of Work are complete.
- D. Provide test data, inspection reports, and certificates in Systems Manual.

#### 1.7 COMMISSIONING DOCUMENTATION

- A. Provide the following information to the CxA for inclusion in the commissioning plan:
  - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
  - 2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
  - 3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.
  - 4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
  - 5. Certificate of readiness certifying that HVAC&R systems, subsystems, equipment, and associated controls are ready for testing.
  - 6. Test and inspection reports and certificates.
  - 7. Corrective action documents.
  - 8. Verification of testing, adjusting, and balancing reports.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 TESTING PREPARATION – BY INSTALLING CONTRACTOR

- A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
- D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified on checklists.
- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

## 3.2 TESTING AND BALANCING VERIFICATION – BY INSTALLING CONTRACTOR

- A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.
- B. Notify the CxA at least 10 days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.
- C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.
  - 1. The CxA will notify testing and balancing Contractor 10 days in advance of the date of field verification. Notice will not include data points to be verified.
  - 2. The testing and balancing Contractor shall use the same instruments (by model and serial number) that were used when original data were collected.
  - 3. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.



### 3.3 GENERAL TESTING REQUIREMENTS BY CxA AND INSTALLING CONTRACTOR

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The CxA along with the HVAC&R Contractor, testing and balancing Contractor, and HVAC&R Instrumentation and Control Contractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

### 3.4 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in HVAC piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:
  - 1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be

physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.

2. Description of equipment for flushing operations.
  3. Minimum flushing water velocity.
  4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.
- B. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.
- C. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

END OF SECTION 230800

## SECTION 232113 - HYDRONIC PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
  - 1. Copper Tube and Fittings
  - 2. Joining materials.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
  - 1. Piping and fittings.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
  - 1. Condensate-Drain Piping: 75 deg F (24 deg C).

#### 2.2 COPPER PIPE AND FITTINGS

- A. DWV Copper Tubing: ASTM B 306, Type DWV.

#### 2.3 JOINING MATERIALS

- A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Condensate-Drain Piping: Type M (Type C) Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

### 3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install gravity condensate drainage piping at a uniform grade of 1 percent downward in direction of flow.
- M. Minimum condensate pipe sizes in accordance with code requirements for specified equipment tonnage, not less than 3/4" or individual unit connection size.
- N. Install equipment manufacturer supplied condensate lift pumps and pipe discharge adaptors where indicated or required.
- O. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

- P. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.

### 3.3 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
  - 2. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
  - 2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
  - 3. NPS 1-1/4 (DN 32): Maximum span, 7 feet (2.1 m); minimum rod size, 3/8 inch (10 mm).
  - 4. NPS 1-1/2 (DN 40): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).

### 3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

END OF SECTION 232113

## SECTION 232300 - REFRIGERANT PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A: 550 psig

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
- C. VRV installer's current training certificates signed by manufacturer's designated training agent in compliance with requirements specified under "Quality Assurance" below and letter indicating another project of similar size, slope and materials within six months of construction start date.
- D. Refrigerant piping and joining system's certificates signed by manufacturer's designated training agent in compliance with requirements specified under "Quality Assurance" below.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports for all piping – signed by installing contractor, certified installer, and general contractor superintendent.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.6 QUALITY ASSURANCE

- A. The piping installer shall be certified for installing the manufacturer's equipment and piping system being installed. A minimum of one certified installer shall be present on site at all times during installation / construction to provide supervision and quality assurance inspection of all

joints, fitting and pressure testing. Presence shall be signed off by general contractor each day refrigerant piping is being installed. The certified training or another project of similar size, scope and materials shall have been completed by the installer on site within 6 months of the construction start date.

- B. Pipe and fittings shall be certified to comply with the following standards:
  1. ASHRAE 15, "Safety Code for Refrigeration Systems."
  2. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."
  3. ASTM B280: Seamless Copper Tube for Air Conditioning and Refrigeration Field service
  4. UL 207: Refrigerant-Containing Components and Accessories, Nonelectrical
- C. VRV systems shall be fully tested for compatibility with piping system by manufacturer.

## 1.7 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

## PART 2 - PRODUCTS

### 2.1 REFRIGERANT TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR seamless copper tube
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Brazing Filler Metals: AWS A5.8.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Hot-Gas, Liquid Lines, and Suction Lines:
  1. Copper, Type ACR, drawn and annealed-temper tubing and wrought-copper fittings with brazed joints.
    - a. Soft annealed copper tubing may be used for sizes 5/8" and smaller and for lengths 35' and under.
    - b. In areas with close proximity of combustible materials a fire watch must be employed by the mechanical contractor at all times that torch brazing is taking place on site and for a minimum of 2 hours after completion of any brazing

operations. Fire watchers shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with facilities for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm.

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. When brazing or soldering, remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- L. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- M. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."
- N. Install sleeves for piping penetrations of walls, ceilings, and floors.
- O. Install sleeve seals for piping penetrations of concrete walls and slabs.
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors.



- Q. Horizontal piping may be installed level, or at a slope of 1 inch per 100 feet toward the indoor unit.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
  2. Provide nitrogen gas flow through piping being brazed to prevent oxidation.

### 3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
  2. Spring hangers to support vertical runs.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
  4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
- D. Support multifloor vertical runs at least at each floor.

### 3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
1. Comply with ASME B31.5, Chapter VI.
  2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
  3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
    - a. Fill system with nitrogen to the required test pressure.
    - b. System shall maintain test pressure at the manifold gage throughout duration of test.

- c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
- d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

### 3.6 SYSTEM CHARGING

#### A. Charge system using the following procedures:

1. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 24 hours, system is ready for charging.
2. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

### 3.7 ADJUSTING

#### A. Adjust set-point temperature of air-conditioning controllers to the system design temperature.

#### B. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open compressor liquid, suction and discharge valves.
2. Open refrigerant valves except bypass valves that are used for other purposes.

END OF SECTION 232300

## SECTION 233113 - METAL DUCTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Rectangular ducts and fittings.
2. Sheet metal materials.
3. Sealant and gaskets.
4. Hangers and supports.

##### B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC".
2. Section 233300 "Air Duct Accessories"

#### 1.2 PERFORMANCE REQUIREMENTS

- A. 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 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" and ASCE/SEI 7.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

#### 1.3 ACTION SUBMITTALS

##### A. Product Data: For each type of product indicated.

##### B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.

9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

#### 1.4 QUALITY ASSURANCE

- A. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

### PART 2 - PRODUCTS

#### 2.1 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.
- B. Transverse Joints: Select joint types and fabricate according to 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."
- C. Longitudinal Seams: Select seam types and fabricate according to 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."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 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."

#### 2.2 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. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  1. Galvanized Coating Designation: G90.

## 2.3 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 according to 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, 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. Flanged Joint Sealant: Comply with ASTM C 920.
  - 1. General: Single-component, acid-curing, silicone, elastomeric.
  - 2. Type: S.
  - 3. Grade: NS.
  - 4. Class: 25.
  - 5. Use: O.
  - 6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

## 2.4 HANGERS AND SUPPORTS

- A. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

## 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 according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts 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 clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

### 3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 2. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.

### 3.3 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, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
  - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
  - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: 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," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. 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.

### 3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.5 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Clean the following components by removing surface contaminants and deposits:
  - 1. Air outlets and inlets (registers, grilles, and diffusers).
  - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  - 4. Coils and related components.
  - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
  - 6. Supply-air ducts, dampers, actuators, and turning vanes.
  - 7. Dedicated exhaust and ventilation components and makeup air systems.
- C. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

### 3.6 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

### 3.7 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.
- B. Fabricate for the pressure and SMACNA seal class required by the application.

Leakage class minimum requirements are:

Up thru 2" WG pressure – rectangular – Class 24, round - Class 12.

Seal class minimum requirements are:

1. Up thru 2" WG pressure - class A for all duct joints.

- C. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

- D. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

- a. Velocity 1000 fpm or Lower:

- 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.



- 2) Mitered Type RE 4 without vanes.
- b. Velocity 1000 to 1500 fpm:
  - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
  - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
  - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- c. Velocity 1500 fpm or Higher:
  - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
  - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
  - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
  - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
  - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
  - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

END OF SECTION 233113

## SECTION 233300 - AIR DUCT ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Manual volume dampers.
  - 2. Turning vanes.
  - 3. Flexible connectors.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
  - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
    - a. Special fittings.
    - b. Manual volume damper installations.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

### PART 2 - PRODUCTS

#### 2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. 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.

## 2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G90.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

## 2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Warming and Ventilating; a Mestek Architectural Group company.
    - b. Flexmaster U.S.A., Inc.
    - c. Ruskin Company.
  - 2. Standard leakage rating, with linkage outside airstream.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:
    - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Stiffen damper blades for stability.
    - d. Galvanized-steel, 0.064 inch thick.
  - 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Oil-impregnated bronze or Molded synthetic.
    - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Galvanized steel.

## 2.4 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Hardcast, Inc.
4. Nexus PDQ.
5. Ward Industries; a brand of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

## 2.5 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aero-Dyne Sound Control Co.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. METALAIRE, Inc.
5. Ward Industries; a brand of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Single wall.

## 2.6 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Ventfabrics, Inc.
4. Ward Industries; a brand of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

## 2.7 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install flexible connectors to connect ducts to equipment.
- G. Connect flexible ducts to metal ducts with draw bands.
- H. Install duct test holes where required for testing and balancing purposes.

### 3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Operate dampers to verify full range of movement.
  - 2. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

## SECTION 233346 - FLEXIBLE DUCTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Insulated flexible ducts.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

### PART 2 - PRODUCTS

#### 2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. 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.
- C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."
- D. Comply with ASTM E 96/E 96M, "Test Methods for Water Vapor Transmission of Materials."

#### 2.2 INSULATED FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Flexmaster U.S.A., Inc.
  - 2. JP Lamborn Co.
  - 3. McGill AirFlow LLC.
  - 4. Thermaflex; a Flex-Tek Group company.
- B. Insulated, Flexible Duct: UL 181, Class 1, two-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
  - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
  - 2. Maximum Air Velocity: 4000 fpm.

3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-Value: Comply with ASHRAE/IES 90.1 R4.2.

### 2.3 FLEXIBLE DUCT CONNECTORS

- A. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.
- C. Connect diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- D. Connect flexible ducts to metal ducts with draw bands.
- E. Install duct test holes where required for testing and balancing purposes.
- F. Installation:
  1. Install ducts fully extended.
  2. Do not bend ducts across sharp corners.
  3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
  4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
  5. Install flexible ducts in a direct line, without sags, twists, or turns.
- G. Supporting Flexible Ducts:
  1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
  2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
  3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
  4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 233346



## SECTION 233400 - HVAC FANS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. The ceiling-mounted, circulation fan is the model scheduled with the capacities indicated. The fan shall be furnished with standard mounting hardware and variable speed control to provide cooling and de-stratification.

##### B. Summary of Work:

1. Installation of the fan, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses and disconnect switches, other than those addressed in the installation scope of work, shall be provided by others.

#### 1.2 REFERENCES

- A. National Fire Protection Agency (NFPA).
- B. Underwriters Laboratory (UL).
- C. Restriction of Hazardous Substances (ROHS).
- D. International Organization for Standardization (ISO).
- E. National Electrical Manufacturers Association (NEMA).

#### 1.3 SUBMITTALS

- A. Shop Drawings: Drawings detailing product dimensions, weight, and attachment methods.
- B. Product Data: Specification sheets on the ceiling-mounted fan, specifying electrical and installation requirements, features and benefits, and controller information.
- C. Installation Guide: The manufacturer shall furnish a copy of all operating and maintenance instructions for the fan. All data is subject to change without notice.

#### 1.4 QUALITY ASSURANCE

##### A. Certifications:

1. The fan assembly, as a system, shall be ETL-certified and built pursuant to the guidelines set forth by UL standard 507 and CSA standard 22.2 No. 113.

2. Controllers shall comply with National Electrical Code (NEC) and Underwriters Laboratory (UL) standards and shall be labeled where required by code.

B. Manufacturer Qualifications :

1. ISO 9001-certified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.
- B. The fan and its components must be stored in a safe, dry location until installation.

1.6 WARRANTY

- A. The manufacturer shall replace any products or components defective in material or workmanship for the customer free of in accordance to the following schedule:

Motor, gearbox, & controller	5 years (Parts)
All other fan components	5 years (Parts)
Labor	1 year

PART 2 - PRODUCT

2.1 MANUFACTURER

- A. Delta T Corporation, dba Big Ass Fans
- B. Entrematic, dba Kelly Fans

2.2 HIGH VOLUME, LOW SPEED FANS

A. Complete Unit:

1. Regulatory Requirements: The entire fan assembly shall be ETL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2.
2. Sustainability Characteristics: The fan shall be designed to move an effective amount of air for cooling and destratification in industrial applications over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.
3. Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.

**B. Airfoil System:**

1. The fan shall be equipped with airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.
2. The fan shall be equipped with eight (8) Powerfoil winglets on the ends of the airfoils and eight (8) AirFences™ positioned on the airfoils at the optimum location for performance. Both the winglets and AirFences shall be molded of polypropylene. The standard color of the winglet and AirFence shall be “Safety Yellow.”

**C. Motor:**

1. The fan motor shall be an AC induction type inverter rated at one of the following:
2. 1725 RPM, 200–250/400–480 VAC, 50/60 Hz, three-phase.
3. 1725 RPM, 200–250 VAC, 50/60 Hz, single-phase.
4. The motor shall be totally enclosed, fan cooled (TEFC) with an IP56 NEMA classification. A NEMA 56C standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in -30oF to 122oF (-34oC to 50oC) ambient conditions.

**D. Gearbox:**

1. The gearbox shall be a helical gear reducer, precision finished from hardened steel for low noise and long service life with double lip seals to retain oil and prevent contamination. The gearbox shall be lubricated for life. The gear reducer shall have a standard backlash of less than 25 arc minutes and be equipped with a 17-4 stainless steel shaft of 1-1/4” (3.2 cm) diameter.

**E. Motor Frame:**

1. The motor frame and mount shall be constructed of steel and powder coated for corrosion resistance and appearance. Non-visible, steel, threaded rods in each structural member of the motor frame shall provide a redundant safety feature in the event of a catastrophic event.

**F. Mounting System:**

1. The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The mounting yoke shall be of welded construction and made from low carbon A36 steel no less than 3/16” (0.5 cm) thick, per ASTM A36, and be powder coated for appearance and resistance to corrosion. No mounting hardware substitutions, including cast aluminum, are acceptable.
2. All mounting bolts shall be SAE Grade 8 or equivalent.

**G. Hub:**

1. The fan hub shall be made of laser cut aluminum for high strength and light weight. The hub shall consist of two aluminum plates, eight (8) aluminum spars and one (1) spacer fastened with a pin and collar rivet system.
2. The hub shall be secured to the output shaft of the gearbox by means of a steel coupling interface. The hub shall incorporate four (4) safety retaining clips made of 1/4” (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.

H. Safety Cable:

1. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be at least 1/4" (0.6 cm) in diameter and fabricated out of 7 x 19 zinc galvanized steel cable. The end loops shall be secured with swaged Nicopress® sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).
2. Field construction of safety cables is not permitted.

I. Variable Frequency Drive:

1. The fan controller shall be a NEMA 4X variable frequency drive (VFD) that is factory programmed to minimize starting and braking torques. The VFD shall have touchpad controls and an LED display for controlling the fan's direction, operation, speed, and programming. The VFD shall be equipped with an EMI/RFI filter to limit interference with other electronic equipment and a rotary switch disconnect for lock-out/tag-out requirements.
2. Onboard Control: The VFD may be mounted on the fan motor frame. A wall-mounted remote keypad shall be provided for such installations. The remote keypad shall be equipped with touchpad controls and an LED display providing access to all controller functions.

J. Fire Control Panel Integration:

1. Includes a 10–30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.

K. Guy wires:

1. Included for installations with extension tubes 4 ft (1.2 m) or longer to limit the potential for lateral movement.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Fan location must have a typical bar joist or existing I-beam structure from which to mount the fan. Additional mounting options may be available.
- B. Mounting structure must be able to support weight and operational torque of fan. Consult structural engineer if necessary.
- C. Fan location must be free from obstacles such as lights, cables, or other building components.
- D. Check fan location for proper electrical requirements. Consult installation guide for appropriate circuit requirements.
- E. Each fan requires dedicated branch circuit protection.

### 3.2 INSTALLATION

- A. The fan shall be installed by a factory-certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle iron for bar joist applications. Big Ass Fans recommends consulting a structural engineer for installation methods outside the manufacturer's recommendation and a certification, in the form of a stamped print or letter, submitted prior to installation.
- B. Minimum Distances:
  - 1. Airfoils must be at least 10 ft (3 m) above the floor.
  - 2. Installation area must be free of obstructions such as lights, cables, sprinklers or other building structures with the airfoils at least 2 ft (0.61 m) clear of all obstructions.
  - 3. The structure the fan is attached to shall be capable of supporting a torque load of up to 300 ft·lb (407 N·m) of torque.
- C. The fan shall not be located where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems or radiant heaters. Additional details are in the Big Ass Fans 3.2 Installation Manual.
- D. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
  - 1. The maximum fan diameter shall be 24 ft (7.3 m).
  - 2. The HVLS fan shall be centered approximately between four adjacent sprinklers.
  - 3. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft (0.9 m).
  - 4. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72-National Fire Alarm and Signaling Code.

END OF SECTION 233400

## SECTION 233423 - HVAC POWER VENTILATORS

### 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. In-line centrifugal fans.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Operating Limits: Classify according to AMCA 99.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material thickness and finishes.
  - 5. Dampers, including housings, linkages, and operators.
  - 6. Roof curbs.
  - 7. Fan speed controllers.
- B. Shop Drawings: 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. Wiring Diagrams: For power, signal, and control wiring.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Belts: One set(s) for each belt-driven unit.

## 1.7 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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

## 1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

## PART 2 - PRODUCTS

### 2.1 IN-LINE CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck
  - 2. Carnes
  - 3. Cook
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

## F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Companion Flanges: For inlet and outlet duct connections.
3. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
5. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.

## G. Capacities and Characteristics:

1. As indicated in equipment schedules.

## 2.2 MOTORS

## A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

## B. Enclosure Type: Totally enclosed, fan cooled.

## 2.3 SOURCE QUALITY CONTROL

## A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

## B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

## A. Install power ventilators level and plumb.

## B. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."



- C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- D. Install units with clearances for service and maintenance.
- E. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

### 3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
  - 1. Verify that shipping, blocking, and bracing are removed.
  - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  - 3. Verify that cleaning and adjusting are complete.
  - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  - 5. Adjust belt tension.
  - 6. Adjust damper linkages for proper damper operation.
  - 7. Verify lubrication for bearings and other moving parts.
  - 8. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

### 3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

END OF SECTION 233423

## SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

### 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 and square ceiling diffusers.
  - 2. Fixed face grilles.

- B. Related Sections:

- 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:

- 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

### PART 2 - PRODUCTS

#### 2.1 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Krueger.
    - b. Price Industries.
    - c. Titus.
  - 2. Devices shall be specifically designed for variable-air-volume flows.
  - 3. Material: Steel.

4. Finish: Baked enamel, white.
5. Face Style: Plaque.

## 2.2 REGISTERS AND GRILLES

### A. Adjustable Bar Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Krueger.
  - b. Price Industries.
  - c. Titus.
2. Material: Steel.
3. Finish: Baked enamel, color selected by Architect .

### B. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Krueger.
  - b. Price Industries.
  - c. Titus.
2. Material: Steel.
3. Finish: Baked enamel, color selected by Architect.

## 2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.

- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

## SECTION 235416 - GAS-FIRED FURNACES

### 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. Gas-fired, condensing furnaces and accessories complete with controls.
  - 2. Air filters.
  - 3. Refrigeration components.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
  - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Include diagrams for power, signal, and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Furnace and accessories complete with controls.
    - b. Air filter.
    - c. UV germicidal light.

- d. Refrigeration components.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Disposable Air Filters: Furnish two complete sets.
  - 2. Fan Belts: Furnish one set(s) for each furnace fan.

## 1.7 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- C. Comply with NFPA 70.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:
  - 1. Warranty Period, Commencing on Date of Substantial Completion:
    - a. Furnace Heat Exchanger: 20 years.
    - b. Integrated Ignition and Blower Control Circuit Board: Five years
    - c. Draft-Inducer Motor: Five years
    - d. Refrigeration Compressors: 10 years.
    - e. Evaporator and Condenser Coils: Five years

## PART 2 - PRODUCTS

### 2.1 ASSEMBLY DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.

### 2.2 GAS-FIRED FURNACES, CONDENSING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Adams Manufacturing Company.

2. Carrier Corporation; a unit of United Technologies Corp.
  3. Comfortmaker Air Conditioning & Heating; an International Comfort Products brand; a unit of United Technologies Corp.
  4. Lennox Industries, Inc.; Lennox International.
  5. Trane.
  6. YORK; a Johnson Controls company.
- B. Cabinet: Galvanized steel.
1. Cabinet interior around heat exchanger shall be factory-installed insulation.
  2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
  3. Factory paint external cabinets in manufacturer's standard color.
  4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.
1. Fan Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
  2. Special Motor Features: Single speed, premium efficiency, as defined in Section 230513 "Common Motor Requirements for HVAC Equipment," and with internal thermal protection and permanent lubrication.
  3. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.
  4. Special Motor Features: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.
- D. Type of Gas: Natural.
- E. Heat Exchanger:
1. Primary: Stainless steel.
  2. Secondary: Stainless steel.
- F. Burner:
1. Gas Valve: 100 percent safety two-stage main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
  2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.
- G. Gas-Burner Safety Controls:
1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
  2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
  3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.



- H. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.
- I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.
- J. Accessories:
  - 1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent.
  - 2. CPVC Plastic Vent Materials:
    - a. CPVC Plastic Pipe: Schedule 40, complying with ASTM F 441/F 441M.
    - b. CPVC Plastic Fittings: Schedule 40, complying with ASTM F 438, socket type.
    - c. CPVC Solvent Cement: ASTM F 493.
- K. Capacities and Characteristics: per Schedule

## 2.3 THERMOSTATS

- A. Controls shall comply with requirements in ASHRAE/IES 90.1, "Controls."
- B. Solid-State Thermostat: Wall-mounted, programmable, microprocessor-based unit with automatic switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, vacation mode, and battery backup protection against power failure for program settings.
- C. Control Wiring: Unshielded twisted-pair cabling.

## 2.4 AIR FILTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Aprilaire; Research Products Corp.
  - 2. Filtrete Home Filtration Products; a 3M brand.
  - 3. General Filters, Inc.
  - 4. Permatron Corporation.
- B. Disposable Filters: 1-inch- thick fiberglass media with ASHRAE 52.2 MERV rating of 6 or higher, in sheet metal frame.

## 2.5 REFRIGERATION COMPONENTS

- A. General Refrigeration Component Requirements:

1. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
  2. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IES 90.1.
- B. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with AHRI 210/240. Match size with furnace. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1.
1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.
- C. Refrigerant Piping: Comply with requirements in Section 232300 "Refrigerant Piping."
- D. Air-Cooled Compressor-Condenser Unit:
1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
  2. Compressor: Hermetically sealed reciprocating type.
    - a. Crankcase heater.
    - b. Vibration isolation mounts for compressor.
    - c. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
    - d. Two-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.
    - e. Refrigerant: R-407C or R-410A.
  3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with liquid subcooler.
  4. Fan: Aluminum-propeller type, directly connected to motor.
  5. Motor: Permanently lubricated, with integral thermal-overload protection.
  6. Low Ambient Kit: Permits operation down to 45 deg F.
  7. Mounting Base: Polyethylene.
- E. Capacities and Characteristics: as Scheduled

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.

- C. Examine roughing-in for gas piping systems to verify actual locations of piping connections before equipment installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
  - 1. Anchor furnace to substrate to resist code-required seismic acceleration.
- C. Controls: Install thermostats at mounting height of 60 inches above floor.
- D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.
- E. Install ground-mounted, compressor-condenser components on 4-inch-thick, reinforced concrete base; 4 inches larger on each side than unit. Coordinate anchor installation with concrete base.

### 3.3 CONNECTIONS

- A. Gas piping installation requirements are specified in Section 221114 "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
  - 1. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
    - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    - b. CPVC Piping: Join according to ASTM D 2846/D 2846M, Appendix.
    - c. PVC Pressure Piping: Join schedule number ASTM D 1785 PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 2. Slope pipe vent back to furnace or to outside terminal.

- D. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."
- E. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled compressor-condenser unit.
- F. Comply with requirements in Section 232300 "Refrigerant Piping" for installation and joint construction of refrigerant piping.

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Perform electrical test and visual and mechanical inspection.
  - 2. Leak Test: After installation, charge systems with refrigerant and test for leaks. Repair leaks, replace lost refrigerant, and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
  - 4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
  - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

### 3.5 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
  - 1. Inspect for physical damage to unit casings.
  - 2. Verify that access doors move freely and are weathertight.
  - 3. Clean units and inspect for construction debris.
  - 4. Verify that all bolts and screws are tight.
  - 5. Adjust vibration isolation and flexible connections.
  - 6. Verify that controls are connected and operational.
- B. Adjust fan belts to proper alignment and tension.
- C. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.
- D. Measure and record airflows.
- E. Verify proper operation of capacity control device.
- F. After startup and performance test, lubricate bearings and adjust belt tension.

### 3.6 ADJUSTING

- A. Adjust initial temperature set points.
- B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

### 3.7 CLEANING

- A. After completing installation, clean furnaces internally according to manufacturer's written instructions.
- B. Install new filters in each furnace within 14 days after Substantial Completion.

### 3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 235416

## SECTION 235513 - GAS-FIRED DUCT HEATERS

### 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 gas-fired duct heaters.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of gas-fired duct heater.
  - 1. Include rated capacities, operating characteristics, and accessories.
- B. Shop Drawings: For gas-fired duct heaters
  - 1. Prepare by or under the supervision of a qualified professional engineer detailing fabrication and assembly of gas-fired duct heaters, as well as procedures and diagrams.
  - 2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
  - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 4. Include diagrams for signal and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Structural members to which equipment will be attached.
  - 2. Items penetrating roof and the following:
    - a. Duct, vent, and gas piping rough-ins and connections.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gas-fired duct heaters to include in emergency, operation, and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period. Burner and components are warranted for one year and heat exchanger is warranted for ten (10) years on a pro-rated basis.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Heatco.
  - 2. Reznor.
  - 3. Modine.

### 2.2 PERFORMANCE REQUIREMENTS

- 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. Capacities and Characteristics:
  - 1. Heat Exchanger: Stainless steel.
  - 2. Burner Material: Stainless steel
  - 3. Venting: Power vented.
  - 4. Turndown: 10:1

### 2.3 MANUFACTURED UNITS

- A. Description: Factory assembled, piped, and wired; and complying with ANSI Z83.8/CSA 2.6. Duct Furnaces shall be Listed for application downstream of refrigeration and cooling systems and shall provide means for removal of condensate that occurs in the heat exchanger tubes during cooling operation. Heat exchanger tubes shall have (integral formed dimpled restrictors;

formed turbulators) to provide for an unobstructed drainage path and tubes shall be formed to provide a positive pitch to promote condensate drainage. Drainage shall be configured so that burners are not exposed to condensate.

B. Duct furnace shall include:

1. A 20 gauge galvanized steel cabinet
2. 1 inch thick, minimum 1 ½ lb./ft.3 density thermal insulation for exterior cabinets
3. Inshot gas burners, with integral carryovers, capable of operation at 10:1 turndown with modulating controls
4. An induced-draft combustion air blower to provide for positive venting of flue gases
5. Provision for attachment of a vent system to exhaust flue gases to outdoors.
6. Combustion air pressure switch to prove air supply for combustion
7. Direct spark ignition of the gas burners with remote flame sensor to prove carryover across all burners
8. Listed Combination Gas Valve incorporating redundant (two) electric safety shut-off valves, manual shut-off , and gas regulator which regulates gas pressure to burner supply manifold.
9. A 1/8" NPT tapped test gauge connection in the gas manifold for measuring gas pressure
10. A union fitting downstream of gas control to facilitate installation and service
11. An automatic reset type high limit switch to limit maximum outlet air temp to less than 250 oF
12. Manual reset flame rollout switch(es).
13. A Class II step down transformer to provide 24 VAC control voltage at selected supply voltage
14. Duct Furnace shall incorporate a Direct Spark Ignition control module that is design certified by a NRTL to ANSI Z21.20 and CAN/CSA-C22.2

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install and connect gas-fired duct heaters and associated fuel and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written instructions.
- B. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
  1. Spring hangers are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
  2. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for spring hangers and seismic restraints.
  3. Restrain the unit to resist code-required horizontal acceleration.



### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to gas-fired duct heaters, allow space for service and maintenance.
- C. Gas Piping: Comply with Section 221114 "Facility Natural-Gas Piping." Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
- D. Vent Connections: Comply with Section 235123 "Gas Vents."
- E. Duct Connections: Comply with Section 233113 "Metal Ducts."
- F. Electrical Connections: Comply with applicable requirements in electrical Sections.
  - 1. Install electrical devices furnished with heaters but not specified to be factory mounted.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 2. Verify bearing lubrication.
  - 3. Verify proper motor rotation.
  - 4. Test Reports: Prepare a written report to record the following:
    - a. Test procedures used.
    - b. Test results that comply with requirements.
    - c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Gas-fired duct heater will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.4 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Adjust burner and other unit components for optimum heating performance and efficiency.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gas-fired duct heaters.

END OF SECTION 235513

## SECTION 237439 - INDOOR PACKAGED DEDICATED OUTDOOR AIR UNITS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Extent of packaged heating and cooling units work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of packaged heating and cooling units specified in this section include the following:
  - 1. Indoor dedicated outdoor air packaged units with ducted condenser.
- C. Refer to other Division-23 sections for automatic temperature controls not factory-installed and required for conjunction with packaged heating and cooling units; not work of this section.
- D. Electrical Work: Refer to Division-23 section "Coordination" for requirements.
- E. Electrical Work: Provide the following wiring as work of this section, in accordance with requirements of Division 26:
  - 1. Provide control wiring between unit-mounted control panel and thermostats, remote control panels, and any other control device furnished as work of this section.
  - 2. Provide factory-mounted and wired controls and electrical devices as specified in this section.
- F. Refer to Division-26 sections for other electrical work including motor starters, disconnects, wires/cables, raceways, and other required electrical devices; not work of this section.

## 1.2 QUALITY ASSURANCE

- A. The system shall be factory tested prior to shipment. Testing shall include but shall not be limited to: system and component operational and functional testing; electrical "HiPot" insulation test; refrigerant and water piping circuit pressuring testing per UL 1995 Safety Standard for Heating and Cooling Equipment. The system shall be designed and manufactured according to world class quality standards.
- B. Codes and Standards: The system shall be listed by Intertek (ETL Semko), Inc. to conform with UL Std 1995 and be certified to CAN/CSA Std C22.2 No. 236 (Control No. 3091370). The system shall be NYC MEA230-06-E and Chicago Code Approved.

## 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights, furnished specialties and accessories; and installation and start-up instructions.

- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to packaged heating and cooling units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation of packaged heating and cooling units and controls. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Maintenance Data: Submit maintenance data and parts list for each packaged heating and cooling unit, control, and accessory; including "trouble-shooting" maintenance guide. Include this data and product data in maintenance manual; in accordance with requirements of Division 1.

#### 1.4 SPARE PARTS

- A. General: Furnish to Owner, with receipt, the following spare parts for each packaged heating and cooling unit.
  - 1. One set of matched fan belts for each belt driven fan.
  - 2. One set of spare filters of each type required for each unit. Obtain receipt from Owner that spare filters have been provided. In addition to the spare set of filters, install new filters at completion of installation work, and prior to testing, adjusting, and balancing work.
  - 3. If HVAC equipment is used during the construction period, Contractor shall provide one set of filters (if system is designed to include pre-filters and after-filters, provide only pre-filters) when the unit is started and replace filters when needed, but not less than every month. On the day of substantial completion, the Contractor shall clean the unit and provide a new set of filters at each location in the unit.

#### 1.5 SPECIAL PROJECT WARRANTY

- A. Warranty on Motor/Compressor: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, motors/compressors with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only and does not include labor for removal and reinstallation.
  - 1. Warranty Period: 5 years from Date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 DEDICATED OUTDOOR AIR PACKAGED UNITS

- A. General: Provide factory-assembled and tested packaged units as indicated, consisting of casing, compressors, evaporator, fans, filters, and unit controls. Provide capacities and electrical characteristics as scheduled.

- B. Casing: The cabinet chassis and access panels shall be constructed of heavy gauge galvanized steel. Cabinet access panels shall rest in recessed pockets designed for minimum air leakage. The cabinet and access panels shall be lined with 2 lb/ft<sup>2</sup> high density sound and thermal insulation conforming to NFPA 90A and 90B.
- C. Compressors: Each compressor shall be the high efficiency, low sound power scroll type. Each compressor shall be mounted on vibration isolators. Each compressor shall be complete with reversible positive oil pump, charging and service ports, internal spring isolation, and discharge gas vibration eliminator. Each refrigeration circuit shall be pre-piped with refrigerant copper tubing. The refrigeration system shall include, but not be limited to: expansion valve with external equalizer; sight glass; refrigerant filter-drier; shraeder service valves and high & low refrigerant pressure safety switches.
- D. Condensers: The system shall be a self-contained with factory mounted integral dx air cooled condensing unit with belt-driven centrifugal blower. The condensing unit shall be sized for full heat of rejection. The system shall require only single point main power supply.
- E. Suction-Line Accumulators: Each refrigerant circuit shall be provided with a factory installed Suction-Line Accumulator to prevent liquid slugging of the compressor and excessive refrigerant dilution of the compressor oil during low load conditions. The accumulator shall return refrigerant and oil to the compressor at a sufficient rate to maintain both system operating efficiency and proper oil level. The accumulators shall be wrapped with a 1/2" closed-cell neoprene insulation to prevent sweating.
- F. Cooling Coils: The DX evaporator coil shall be constructed of copper tubes and aluminum fins. The system shall be designed for a draw-through air pattern for maximum heat transfer. Coil end-plates shall be hot dipped galvanized. The evaporator coil shall be mounted in an insulated stainless-steel condensate drain pan.
- G. Hot Gas Reheat: The system shall be provided with a hot gas reheat coil with modulating control valve. The hot gas reheat coil shall be sized to provide free-energy space neutral leaving air temperature by offsetting the sensible cooling during dx compressor operation
- H. Gas Heating Coil: Refer to specification section 235500 Fuel Fired Heaters for field installed duct heater. Control of duct heater shall be integral to packaged dedicated outdoor air handling unit.
- I. Fans: The blower shall be the belt-driven centrifugal type, double width double inlet (DWDI), and statically and dynamically balanced to a minimum vibration level. The shaft shall be heavy duty steel with self-aligning ball bearings sized for an average 100,000 hours of service life. The blower motor shall be mounted on an adjustable base. Belts shall be sized for 200% of the motor horsepower rating. Motors shall have overload protection and a minimum NEMA service factor of 1.15.
- J. Filters: The filter(s) shall be 2 inch thick pleated and rated for 30% dust spot efficiency (based on ASHRAE 52.1). The filter(s) shall be serviceable through a side access panel without shutting down the system.
- K. Controls: The system shall be provided with a MC-3000™ advanced microprocessor-based controller with 100% outside air dew point temperature control algorithm logic. The controller shall also include free-economizer cooling and proportional analog (0-10Vdc) reheat/heat control.

- L. Temperature Control: Refer to other Division-23 sections for controls; work of this section.
- M. Manufacturer: Subject to compliance with requirements, provide variable air volume units of one of the following:
  - 1. Above Air Technologies
  - 2. Addison
  - 3. Daikin Applied.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions under which packaged heating and cooling units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### 3.2 INSTALLATION OF PACKAGED UNITS

- A. General: Install packaged heating and cooling units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Support: Install vertical floor mounted units on 4" high concrete pad, 4" larger on each side than equipment base. Cast anchor bolt inserts into pad. Install horizontal ceiling mounted units from structure with vibration isolation as recommended by manufacturer and as specified in schedules.
- C. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical installer.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.
- D. Ductwork: Refer to Division-23 section "Metal Ducts". Connect supply and return ducts to unit with flexible duct connections. Provide transitions to exactly match unit duct connection size.
  - 1. Connect outside air duct to unit with flexible connection, provide manual damper, quadrant and lock.
  - 2. Connect condenser supply and exhaust ducts to unit with flexible connections.
- E. Piping: Piping installation requirements are specified in other Division 23 sections. The Drawings indicate the general arrangement of piping, valves, fittings, and specialties. The following are specific connection requirements:
  - 1. Arrange piping installations adjacent to units to allow unit servicing and maintenance.
  - 2. Connection piping to air-handling units with flexible connectors.
  - 3. Route unit condensate drain to location shown on the drawings or, if not shown, to nearest indirect waste connection. Provide trap at drain pan, minimum of 1" deeper than fan

pressure in inches of water and install cleanouts at changes in direction. Size condensate drain piping in accordance with local code and the following:

Piping Length	Size
Less than 10 feet	Same size as unit connection
More than 10 feet	One pipe size larger than unit connection

### 3.3 ADJUSTING, CLEANING, AND PROTECTING

- A. Adjust fan for required airflow in accordance with Section “Testing, Adjusting and Balancing for HVAC.” Tighten belts as required for proper operation.
- B. Adjust water coil flow, with control valves to full coil flow, to indicated gpm.
- C. Adjust damper linkages for proper damper operation.
- D. Clean the entire unit including cabinet interiors just prior to substantial completion to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, intake plenum cabinet, heat exchange surfaces, cooling/heating coil sections, filter sections, access sections, etc.

### 3.4 STARTUP

- A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:
  1. Remove shipping, blocking, and bracing.
  2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
  3. Perform cleaning and adjusting specified in this Section.
  4. Disconnect fan drive from motor and verify proper motor rotation direction and verify fan wheel free rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.
  5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
  6. Set outside-air and return-air mixing dampers to minimum outside-air setting.
  7. Comb coil fins for parallel orientation.
  8. Install clean filters. Do not operate air handling unit without pre-filters installed.
  9. Verify manual and automatic volume control, and fire and smoke dampers in connected ductwork systems are in the full-open position.
  10. Disable automatic temperature control operators.
- B. Start-Up Services: Start-up packaged heating and cooling units in accordance with manufacturer's written start-up instructions. Do not operate units without filters installed. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
  1. Energize motor, verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.

- a. Replace fan and motor pulleys as required to achieve design conditions.
- b. Measure and record motor electrical values for voltage and amperage.
- c. Shut unit down and reconnect automatic temperature control operators.
- d. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for procedures for system testing, adjusting, and balancing.

### 3.5 TRAINING

- A. General: At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel for a minimum of four hours on the operation and maintenance of the equipment provided under this section.
- B. Content: Training shall include but not be limited to:
  1. Overview of the system and/or equipment as it relates to the facility as a whole.
  2. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention.
  3. Review data included in the operation and maintenance manuals. Refer to Division 1 Section "Operating and Maintenance Data."
- C. Certification: Contractor shall submit to the Engineer a certification letter stating that the Owner's designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The certification letter shall be signed by the Contractor and the Owner's representative indicating agreement that the training has been provided.
- D. Schedule: Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION 237439



## SECTION 238000 - VARIABLE REFRIGERANT VOLUME SYSTEMS

### 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. A variable capacity, heat recovery/heat pump air conditioning variable refrigerant volume type split system. The system shall consist of multiple evaporators, connected to a single condenser unit or multiple condenser units. The condenser shall be a direct expansion (DX), air-cooled heat recovery/heat pump air conditioning system, variable-speed driven compressor, multi-zone split system using R-410A refrigerant. The condensing unit may connect an indoor evaporator capacity up to 130% to that of the condensing unit capacity. All indoor units are each capable of operating separately with individual temperature control.
- B. The variable refrigerant volume system shall not be allowed to be operated to provide temporary heating and cooling during building construction and renovation. If Engineer/Owner/General Contractor notice buildup of dirt, grime, dust or construction debris in any of the system equipment used or not during construction the installing Contractor will be responsible for cleaning to like new conditions and verifying proper operations or replacing defective equipment.

#### 1.3 SUBMITTALS

- A. System training certificates for each installing laborer, certificates shall be maintained on job site at all times.
- B. Training certificate of personnel trained on service, certificates shall be maintained on job site at all times.
- C. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- D. Shop Drawings: Diagram power, signal, and control wiring.
- E. Written three (3) year warranties for full equipment parts and labor.
- F. Written three (3) year warranties for preventative maintenance program.
- G. Preventative Maintenance company with program for monthly, quarterly, bi-annual or yearly equipment maintenance and testing.

- H. Manufacturers Field quality and control test reports.
- I. Signed Field quality and controls test reports for signed by installing Contractor Superintendent and Manufacturer Technician. The reports shall be submitted prior to startup, if reports are not submitted startup shall not take place. Reports include:
  - 1. System piping pressure test/evacuation reports.
  - 2. System start-up readiness reports.
  - 3. System start-up procedures and checklist.
- J. Refrigerant charge and charging procedures.
- K. Startup system refrigerant charging reports signed by installing Contractor Superintendent and Manufacturer Technician.
- L. Operation and Maintenance Data for operation and maintenance manuals.
- M. Upon job completion: Provide Owner with an electronic copy of approved submittal, mobile service and diagnostic software (VRF system service diagnostics) software, project Mechanical and control drawings, all as-built piping drawings, O&M's, trouble shooting guides, service manuals and engineering manuals in PDF format. Including any specialized repair tools needed for system maintenance. Any Manufacturer proprietary software updates shall be given free of charge to the Owner for 5 years.

#### 1.4 WARRANTY

- A. The units shall have a full Manufacturer's parts and Contractor labor warranty for a period of three (3) years from date of documented start-up. During the stated period, should any part fail due to defects in material and installing workmanship, it shall be repaired or replaced at no cost to the Owner. This includes all refrigerant costs. The warranty shall be carried by the VRV Manufacturer or installing Contractor, not by a third party.
- B. Preventative Maintenance (PM) Service: PM Service shall be provided by a factory authorized service technician/Contractor for a period of three (3) years. Technicians shall be commercially licensed refrigeration technicians with EPA Section 608 Universal Certification. Technicians must have been trained and certified on system on proposed Manufacturer's VRF system and shall have a minimum five (5) years experience in HVAC service, and must hold current certifications for the proposed VRF system Manufacturer for commissioning, service, troubleshooting, and controls.
- C. Full ten (10) year parts warranty in conjunction iwht three (3) year parts and labor warranty from date of documented start-up shall be provided by Manufacturer.

#### 1.5 QUALITY ASSURANCE

- A. The system shall be installed by a Manufacturer factory trained and Manufacturer approved Contractor.

- B. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
- C. All wiring shall be in accordance with the National Electric Code (NEC).
- D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- E. Mechanical equipment for wind-born debris regions shall be designed in accordance with ASCE 7-2002 and installed to resist the wind pressures on the equipment and the supports.
- F. The condensing unit will be factory charged with R-410A.

## 1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed.
  - 1. Filters: One set of filters for each unit.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers are:
  - 1. Daikin.
  - 2. LG.
  - 3. Mitsubishi.

### 2.2 RECESSED CEILING CASSETTE INDOOR UNIT

- A. General:
  - 1. Indoor unit shall be a ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grill. 36" X 36" shall be a round flow air distribution type, fresh white, impact resistant with a washable decoration panel. 24" X 24" shall be 4-way air distribution and designed to fit in a narrow T grid without overlapping adjacent panels or lights. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature.
- B. Indoor Unit:

1. Unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. Return air shall be through the concentric panel, which includes a resin net, mold resistant, antibacterial filter.
5. The indoor units shall be equipped with a condensate pan with antibacterial treatment and condensate pump. The condensate pump provides up to 27" of lift and has a built in safety shutoff and alarm.
6. The indoor units shall be equipped with a return air thermistor.
7. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
8. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:

1. The cabinet shall be space saving and shall be located into the ceiling.
2. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
3. The airflow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.
4. A branch duct knockout shall exist for branch ducting of supply air.
5. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with three fan speeds available.
2. The fan motor shall be EC type and operate on 208/230 volts, 1 phase, 60 hertz.
3. The airflow rate shall be available in three settings.
4. The fan motor shall be thermally protected.

E. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin and antibacterial treatment.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a Mechanical bond.
2. The coil shall be louver fin, rifled bore tube design.
3. A condensate pan with antibacterial treatment shall be located under the coil.
4. A condensate pump with a minimum 24" lift shall be located below the coil in the condensate pan with a built in safety alarm.
5. A thermistor will be located on the liquid and gas line.

## G. Electrical:

1. The power supply to the unit shall be as scheduled.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

## H. Fan Coil Optional Accessories Required:

1. Air filter
2. Room controller with built-in sensor
3. Interlock for smoke detector to shut down fan coil and send zone specific alarm to central controller without killing power to the system or interrupting other zones.
4. Unit mounted occupancy sensor and infrared floor sensor.

## 2.3 HEAT RECOVERY OUTDOOR CONDENSING UNIT

## A. General:

1. The condensing unit shall have all necessary electronic and refrigerant controls. The refrigeration circuit of each condensing unit shall consist of inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
2. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions.
3. High/low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor units.
4. Low Ambient Heating – Unit shall provide air cooled heating operation down to -13°F WB as standard.
5. VFD Inverter Control and Variable Refrigerant Temperature - Each condensing unit shall use high efficiency compressor(s) coupled with inverter fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions.
6. Indoor shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.
7. Defrost Cycle – VRV systems shall perform defrost cycle at optimum time as determined by system.
8. Oil Return Cycle – VRV systems shall perform oil return cycle at optimum time as determined by system.
9. The sound pressure level standard shall be that value as listed in the engineering manual for the specified models at 3 feet from the front of the unit, not exceeding 65 dBA per module. The condensing unit shall be capable of operating automatically at further reduced noise during night time.
10. The system will automatically restart operation after a power failure and will not cause any

settings to be lost, thus eliminating the need for reprogramming.

B. Unit Cabinet:

1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:

1. All condensing unit sizes shall consist of minimum two or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
3. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 6,700 CFM to 20,650 CFM dependent on model specified.
4. Nominal sound pressure levels shall be Maximum of 60db.
5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a Mechanical bond.
2. The heat exchanger coil shall be of a louver fin and bore tube design.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves Mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti-corrosion acrylic resin.
5. The fins are to be covered with an anti-corrosion Ultra Gold coating as standard with a salt spray test rating of 1000hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10).

E. Compressor:

1. The inverter compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value. Non –inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G2-type” with a maximum

speed of 7,980 rpm.

3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 4% to 100%.
5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
6. Oil separators shall be standard with the equipment together with an intelligent oil management system.
7. The compressor shall be spring mounted to avoid the transmission of vibration.
1. In the event of compressor failure and if multiple compressors are in single module the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.

F. Electrical:

1. The power supply to the unit shall be as scheduled.
2. The control voltage between the indoor and condensing unit shall be non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.

G. Accessories:

1. Hail guards.
2. Cottonwood filter.
3. As scheduled.

## 2.4 BRANCH SELECTOR BOX FOR HEAT RECOVERY SYSTEM

A. General:

1. Selector boxes shall be factory assembled, wired, and piped.
2. Branch controllers must be run tested at the factory.
3. Selector boxes must be mounted indoors.
4. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. Unit Cabinet:

1. Units shall have a galvanized steel plate casing.
2. Each cabinet shall house electronic or solenoid expansion valves for refrigerant control per branch.
3. Cabinet shall contain one subcooling heat exchanger per branch.
4. Unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.

C. Refrigerant Valves:

1. The unit shall be furnished with electronic expansion valves to control the direction of refrigerant flow.
2. The refrigerant connections must be of the braze type.
3. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.

D. Condensate Removal:

1. Units that require condensate removal shall be provided with a secondary drain pan and condensate safety switch. If condensate is detected all units served by the box shall automatically shut down, provide contactors and control wiring as required to accomplish sequence.

E. Electrical:

1. The power supply to the unit shall be as scheduled
2. The unit shall be capable of operation within the limits of 187 volts to 253 volts.
3. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.

## 2.5 CONTROLS

A. Zone Controller shall be provided with or capable of the following:

1. Backlit LCD display
2. Display of room and setpoint temperatures per 1°F/C
3. Independent cool/heat setpoints with setpoint range limits
4. Auto-changeover mode shall automatically select cool/heat mode at setpoint  $\pm 1^\circ$  F (for heat pump and heat recovery systems)
5. Built in 7, 5+2, 5+1+1 Weekly Schedule Timer with up to 5 actions per day with independent cool/heat or setback setpoints
6. Temperature sensor located inside of remote controller
7. Immediate display of fault location and condition
8. 48 hour clock/calendar backup
9. Operation
  - a. On/off, Operation Mode (Cool/Dry/Heat/Auto/Fan), Fan Speed, Airflow Direction, Setpoints (60-90F), Setback Setpoints (40-95F), Auto-changeover (Heat Pump, Heat Recovery), Individual Permit/Prohibit Buttons
10. Monitoring
  - a. Operation (on/off) status, operation mode, fan speed, airflow direction, setpoints & setback setpoints, room temperature, malfunction flashing, error code, filter status
11. Control Management
  - a. Field setting mode, group setting mode, setpoint range limit, auto re-start



## 12. Scheduling

- a. 7-day, 12/24 hour time clock
- b. 7, 5+2, 5+1+1 weekly schedule pattern
- c. 5-Action per day with independent setpoints
- d. Service personnel shall be able to access the following from the room controller:
  - 1) Return Air Temperature
  - 2) Liquid Line Temperature
  - 3) Gas Line Temperature
  - 4) Remote Controller Sensor Temperature
  - 5) Temperature used for Indoor Unit Control
- e. In addition to standard display mode, the thermostat must also be set up to be configured to allow for optional face plates or programming to allow for simpler display while still having access to all service and control functions.

### B. Variable Refrigerant Temperature

1. Variable Refrigerant Temperature shall be programmed to allow for increased efficiency without sacrificing comfort. Default setting shall be for automatic mode which will reduce the refrigerant lift for peak efficiencies at part-load, and lower the refrigerant temperature on the highest demand days for quickest reaction speed. Additional mode settings include high sensible mode and basic mode.

### C. Auto-Changeover

1. Auto-changeover shall be programmed to allow for the optimal room temperature to be maintained by automatically switching mode between Cool and Heat in accordance with the room temperature and setpoint.
  - a. The setpoint differential should be adjustable between 0°F to 13°F. The (Thermal) Differential is the tolerance for the indoor unit's setpoint.
  - b. The operational mode shall change from cooling to heating when the room setpoint is exceeded by 1°F (adjustable).
  - c. The operational mode shall change from heating to cooling when the room temperature drops 1°F (adjustable) below setpoint.
  - d. A guard timer (adjustable 15-60 minutes) should be in place to prevent rapid changing, but is overridden if the room setpoint is changed.

### D. Remote Access

1. Provide access to the Central Control System from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP).
2. The system shall be capable of supporting multiple clients using a standard Web browser such as Internet Explorer. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not

be acceptable.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install indoor fan coil unit components using Manufacturer's standard mounting devices securely fastened to building structure.
- B. Install all condensing units as indicated on drawings.

#### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."
- D. All low voltage control cabling shall be by Mechanical Contractor.
- E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- F. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

#### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Manufacturer Technician shall visit the job site a minimum of three (3) times during equipment installation to inspect installation quality and answer Contractor questions and shall submit field reports to Engineer. This technician shall be onsite to perform the start-up and commissioning of the system including all controls, as well as provide a complete on-site Owner training.
- B. Contractor shall remove and replace malfunctioning parts or units as noted by Manufacturer Technician and Manufacturer Technician shall and retest upon replacement.
- C. Contractor shall perform the following field tests and inspections and prepare test reports:
  - 1. All piping shall be pressure tested and reports shall be submitted prior to startup and inserted with O&M manual.
  - 2. Leak Test: After installation, pressuring system to 550 psi and hold for 24 hours minimum. Include pressure equalization pipe on heat recovery.

3. Triple evacuate to 500 microns or less; include pressure equalization pipe on heat recovery.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Leak test reports to be reviewed and accepted by Manufacturer Technician prior to startup.

### 3.4 STARTUP REQUIREMENTS

#### A. Actions required by Manufacturer Representative:

1. Provide or oversee full startup service.
2. Verify the following items:
  - a. Fan coil field settings per the job specific requirement.
  - b. Remote interlock of safety devices including smoke detectors, condensate safety switches and all interlocking devices
  - c. Each branch selector's operation shall be field verified for heating / cooling change-over per the job specific requirement.
  - d. System addressing including any setting of dip switches and setting of all unit addresses for the central controller and building management system.
3. Provide variable refrigerant temperature settings to be configured by startup technician as applicable to the project.
4. Provide individual field settings of each unit to be documented by start-up technician and provided as part of the start-up report.
5. Witness/command each terminal fan coil unit from heating and cooling and back with each setting lasting as long as required for observer to see room temperature change by a minimum of 3 degF.

#### B. Actions required by installing Contractor:

1. Prior to start-up, provide in writing documentation of installation training for on-site installers.
2. Provide constant system pressurization with flow of dry nitrogen during all system brazing.
  - 1) Document total volume of nitrogen used on job and provide written confirmation that positive nitrogen charge was verified during full piping installation. This documentation is to be submitted to Manufacturer's agent prior to system start-up and to be included in close-out documents.
  - 2) Manufacturer's agent may require a carbon test prior to system pressure test. The suction line will be cut and the system purged with dry nitrogen to blow through any scale onto a test cloth. If the test is failed fittings are to be cut out of system and inspected. If pipe fittings and or braze joints show carbon deposits or fouling Contractor shall at their expense clean all interior surfaces of all piping systems to remove any foreign material prior to start up. Piping connections to all fan coils and BS boxes must be removed prior to remediation and reconnected and retested at Contractor's expense.

3. Upon completion of piping system, provide witnessed pressure test on every system of 550 PSI maintained over 24 hours before system evacuation. Pressure test is to be signed off by installing Contractor and building General Contractor with photographic evidence of pressure tests.
4. System is to be triple evacuated. Final evacuation should hold less than 500 microns for at least twenty four (24) hours without the vacuum pump running. Final system vacuum must be verified by the Manufacturer before the system is charged.
5. Power and control wiring and systems shall complete and verified before system charge. Full system communication is to be verified before system is charged so that system can be placed in evacuation mode while still on the vacuum
6. All equipment shall be verified to be protected by air filters.
7. All system piping lengths are to be noted as installed on the refrigerant piping schematics. Pipe lengths are to be accurately measured and noted by the Contractor on the Manufacturer provided piping schematics. This is to be used to calculate the refrigerant trim charge. As-built installed piping lengths and the corresponding charge is to be provided to Manufacturer prior to system start-up and submitted with close-out documents.

C. Actions required by both the installing Contractor and the Manufacturer representative:

1. Verify proper refrigerant charge and charging procedures per Manufacturer were followed.

3.5 DEMONSTRATION

A. Engage a factory authorized trainer and technician to train Owner's maintenance personnel to adjust, operate, and maintain units.

1. Provide minimum of four (4) hours Owner training sessions.
2. Provide three (3) local advanced training classes for Owner's service personnel up to three (3) personnel each.
3. Obtain written Owner acceptance of training.

END OF SECTION 238000

## SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes split-system air-conditioning consisting of separate evaporator-fan and compressor-condenser components.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: 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.

#### 1.3 CLOSEOUT SUBMITTALS

- A. 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. ASHRAE Compliance:
  - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
  - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period:

- a. For Compressor: Five year(s) from date of Substantial Completion.
- b. For Parts: One year(s) from date of Substantial Completion.
- c. For Labor: One year(s) from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Daikin.
  2. Mitsubishi Electric & Electronics USA, Inc.
  3. LG
  4. Samsung

### 2.2 WALL-MOUNTED INDOOR UNIT

- A. The indoor unit shall be a wall mounted fan coil unit with finished white casing for installation onto a wall within a conditioned space.
- B. Acoustic Performance:
  1. The indoor units sound pressure shall range from 31 dB(A) to 40 dB(A) at low speed measured at 3.3 feet below and from the unit.
- C. Construction:
  1. The indoor unit shall be completely factory assembled and tested. The unit shall include factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The remote controller shall be able to set five (5) steps of discharge angle. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe shall connect from either left or right sides.
  2. Return air shall be through a resin net mold-resistant filter.
  3. The indoor unit shall be equipped with a mildew-proof, polystyrene condensate drain pan.
  4. The indoor unit shall be equipped with a return air thermistor.
  5. The indoor unit shall be separately powered with 208~230V/1-phase/60Hz.
- D. Unit Cabinet:
  1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
  2. The cabinet shall be constructed of molded plastic cover with sound absorbing foamed polystyrene and polyethylene insulation.

## E. Fan:

1. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz.
3. The airflow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.

## F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2 row cross fin copper evaporator coil with 14 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate drain shall be 1 1/16 inch outside diameter PVC.
5. A thermistor shall be located on the liquid and gas line.
6. A condensate pan shall be located in the unit.

## G. Electrical:

1. The power supply to the unit shall be as scheduled.

## H. Fan Coil Optional Accessories Required:

1. Air filter
2. Room controller with built-in sensor
3. A field mounted condensate pump, powered by the fan coil unit with a safety cut off switch.
4. Interlock for remote safety device to shut down fan coil.
5. PVC pipe covering for both refrigerant piping and condensate pump if exterior to unit.

## 2.3 OUTDOOR UNITS (5 TONS OR LESS)

## A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - a. Compressor Type: Scroll.
  - b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
  - c. Refrigerant Charge: R-410A.
  - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Fan: Aluminum-propeller type, directly connected to motor.
4. Motor: Permanently lubricated, with integral thermal-overload protection.
5. Low Ambient Kit: Permits operation down to 0 deg F.
6. Mounting Base: Concrete or Polyethylene.

## 2.4 ACCESSORIES

- A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- B. Automatic-reset timer to prevent rapid cycling of compressor.
- C. Drain Hose: For condensate.

## 2.5 CAPACITIES AND CHARACTERISTICS

- A. See schedule.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounted, compressor-condenser components on equipment supports.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:



1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

#### 3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

**SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Connectors, splices, and terminations rated 600 V and less.

**1.2 ACTION SUBMITTALS****A. Product Data:** For each type of product.**PART 2 - PRODUCTS****2.1 COPPER BUILDING WIRE****A. Description:** Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.**B. Manufacturers:** Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Cerro Wire LLC.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. Okonite Company (The).
8. Service Wire Co.
9. Southwire Company.
10. WESCO.

**C. Standards:**

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Conductor Insulation:
  - 1. Type NM: Comply with UL 83 and UL 719.
  - 2. Type RHH: Comply with UL 44.
  - 3. Type THHN: Comply with UL 83.
  - 4. Type THW: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
  - 5. Type XHHW-2: Comply with UL 44.

## 2.2 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alpha Wire Company.
  - 2. American Bare Conductor.
  - 3. Belden Inc.
  - 4. Encore Wire Corporation.
  - 5. General Cable Technologies Corporation.
  - 6. Okonite Company (The).
  - 7. Service Wire Co.
  - 8. Southwire Company.
  - 9. WESCO.
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Comply with UL 1569.
  - 3. RoHS compliant.
  - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
  - 1. multicircuit with color-coded conductors.
  - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- F. Ground Conductor: Insulated.
- G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

- H. Armor: Steel, interlocked.
- I. Jacket: PVC applied over armor.

### 2.3 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. 3M Electrical Products.
  2. AFC Cable Systems; a part of Atkore International.
  3. Gardner Bender.
  4. Hubbell Power Systems, Inc.
  5. Ideal Industries, Inc.
  6. ILSCO.
  7. NSi Industries LLC.
  8. O-Z/Gedney; a brand of Emerson Industrial Automation.
  9. Service Wire Co.
  10. TE Connectivity Ltd.
  11. Thomas & Betts Corporation; A Member of the ABB Group.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- E. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway Type USE, single conductor in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

### 3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

### 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### 3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519

## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
  - 1. Underground distribution grounding.
  - 2. Ground bonding common with lightning protection system.
  - 3. Foundation steel electrodes.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

### PART 2 - PRODUCTS

#### 2.1 SYSTEM DESCRIPTION

- 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 UL 467 for grounding and bonding materials and equipment.

#### 2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advanced Lightning Technology, Ltd.
  - 2. Burndy; Part of Hubbell Electrical Systems.

3. Dossert; AFL Telecommunications LLC.
4. ERICO International Corporation.
5. Fushi Copperweld Inc.
6. Galvan Industries, Inc.; Electrical Products Division, LLC.
7. Harger Lightning & Grounding.
8. ILSCO.
9. O-Z/Gedney; a brand of Emerson Industrial Automation.
10. Robbins Lightning, Inc.
11. Siemens Industry, Inc., Energy Management Division.

## 2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  1. Solid Conductors: ASTM B 3.
  2. Stranded Conductors: ASTM B 8.
  3. Tinned Conductors: ASTM B 33.
  4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
  7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

## 2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.



- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with socket set screw.
- I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- K. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- L. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- M. Straps: Solid copper, copper lugs. Rated for 600 A.
- N. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal two-piece clamp.
- O. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- P. Water Pipe Clamps:
  - 1. Mechanical type, two pieces with stainless-steel bolts.
    - a. Material: Tin-plated aluminum.
    - b. Listed for direct burial.
  - 2. U-bolt type with malleable-iron clamp and copper ground connector.

## 2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).
- B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches (600 mm) below grade.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

### 3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

### 3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

### 3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

### 3.5 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
1. Feeders and branch circuits.
  2. Lighting circuits.
  3. Receptacle circuits.
  4. Single-phase motor and appliance branch circuits.
  5. Three-phase motor and appliance branch circuits.
  6. Flexible raceway runs.
  7. Armored and metal-clad cable runs.

8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
  9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

### 3.6 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
  1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
  3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
  5. Substations and Pad-Mounted Equipment: 5 ohms.
  6. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

## SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of product.

##### B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

##### B. Welding certificates.

#### 1.4 QUALITY ASSURANCE

##### A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D 635.

### 2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. ERICO International Corporation.
    - d. Flex-Strut Inc.
    - e. Gripple Inc.
    - f. GS Metals Corp.
    - g. G-Strut.
    - h. Haydon Corporation.
    - i. Metal Ties Innovation.
    - j. Thomas & Betts Corporation; A Member of the ABB Group.
    - k. Unistrut; Part of Atkore International.
    - l. Wesanco, Inc.
  - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
  - 4. Channel Width: Selected for applicable load criteria.
  - 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in

riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti, Inc.
      - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) B-line, an Eaton business.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) Hilti, Inc.
      - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      - 5) MKT Fastening, LLC.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 6. Toggle Bolts: All-steel springhead type.
  - 7. Hanger Rods: Threaded steel.

### 2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.



## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  - 1. NECA 1.
  - 2. NECA 101
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. **Maximum Support Spacing and Minimum Hanger Rod Size for Raceways:** Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- E. **Multiple Raceways or Cables:** Install trapeze-type supports fabricated with steel slotted [**or other**] support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. **Raceway Support Methods:** In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to NFPA 70.
- C. **Strength of Support Assemblies:** Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. **Mounting and Anchorage of Surface-Mounted Equipment and Components:** Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  4. To Existing Concrete: Expansion anchor fasteners.
  5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
  6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
  7. To Light Steel: Sheet metal screws.
  8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 260529

## SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetallic conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

##### B. Related Requirements:

1. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of product.

##### B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

### PART 2 - PRODUCTS

#### 2.1 METAL CONDUITS, TUBING, AND FITTINGS

##### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; a part of Atkore International.
2. Allied Tube & Conduit; a part of Atkore International.
3. Anamet Electrical, Inc.
4. Calconduit.
5. Electri-Flex Company.
6. FSR Inc.
7. Korkap.
8. NEC, Inc.
9. Opti-Com Manufacturing Network, Inc (OMNI).
10. O-Z/Gedney; a brand of Emerson Industrial Automation.
11. Perma-Cote.
12. Picoma Industries, Inc.

13. Plasti-Bond.
  14. Republic Conduit.
  15. Southwire Company.
  16. Thomas & Betts Corporation; A Member of the ABB Group.
  17. Topaz Electric; a division of Topaz Lighting Corp.
  18. Western Tube and Conduit Corporation.
  19. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
  2. Coating Thickness: 0.040 inch (1 mm), minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
  2. Fittings for EMT:
    - a. Material: Steel or die cast.
    - b. Type: Setscrew or compression.
  3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
  4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.
- 2.2 NONMETALLIC CONDUITS AND FITTINGS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; a part of Atkore International.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX INC.
5. CertainTeed Corporation.
6. Champion Fiberglass, Inc.
7. Condux International, Inc.
8. Electri-Flex Company.
9. FRE Composites.
10. Kraloy.
11. Lamson & Sessions.
12. Niedax Inc.
13. RACO; Hubbell.
14. Thomas & Betts Corporation; A Member of the ABB Group.
15. Topaz Electric; a division of Topaz Lighting Corp.
16. United Fiberglass.

- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. LFNC: Comply with UL 1660.
- F. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: Comply with UL 514B.
- H. Solvents and Adhesives: As recommended by conduit manufacturer.

### 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. B-line, an Eaton business.
  2. Hoffman; a brand of Pentair Equipment Protection.
  3. MonoSystems, Inc.
  4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

#### 2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Allied Moulded Products, Inc.
  - 2. Hoffman; a brand of Pentair Equipment Protection.
  - 3. Lamson & Sessions.
  - 4. Niedax Inc.
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

#### 2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Adalet.
  - 2. Crouse-Hinds, an Eaton business.
  - 3. EGS/Appleton Electric.
  - 4. Erickson Electrical Equipment Company.
  - 5. FSR Inc.
  - 6. Hoffman; a brand of Pentair Equipment Protection.
  - 7. Hubbell Incorporated.
  - 8. Hubbell Incorporated; Wiring Device-Kellems.
  - 9. Kraloy.
  - 10. Milbank Manufacturing Co.
  - 11. MonoSystems, Inc.
  - 12. Oldcastle Enclosure Solutions.
  - 13. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 14. Plasti-Bond.
  - 15. RACO; Hubbell.
  - 16. Spring City Electrical Manufacturing Company.
  - 17. Stahlin Non-Metallic Enclosures.
  - 18. Thomas & Betts Corporation; A Member of the ABB Group.
  - 19. Topaz Electric; a division of Topaz Lighting Corp.

## 20. Wiremold / Legrand.

- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- K. Gangable boxes are allowed.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic.
  - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- M. Cabinets:
  - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.
  - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## PART 3 - EXECUTION

## 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: RNC, Type EPC-40-PVC.
  2. Concealed Conduit, Aboveground: EMT.
  3. Underground Conduit: RNC, Type EPC-40-PVC.
  4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated.
1. Exposed, Not Subject to Physical Damage: EMT.
  2. Exposed, Not Subject to Severe Physical Damage: EMT.
  3. Exposed and Subject to Severe Physical Damage: IMC. Raceway locations include the following:
    - a. Loading dock.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.
  4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  6. Damp or Wet Locations: IMC.
  7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  3. EMT: Use setscrew, fittings. Comply with NEMA FB 2.10.
  4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).



### 3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- H. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  - 5. Change from ENT to RNC, Type EPC-40-PVC, before rising above floor.
- I. Stub-ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or RMC for raceways.
  - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- O. Surface Raceways:
1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
  2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where an underground service raceway enters a building or structure.
  3. Where otherwise required by NFPA 70.
- R. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m).
  2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F (0.06 mm per meter of length of straight run per degree C) of temperature change for PVC conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
  2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- W. Locate boxes so that cover or plate will not span different building finishes.
- X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- Z. Set metal floor boxes level and flush with finished floor surface.
- AA. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
  2. Install backfill as specified in Section 312000 "Earth Moving."
  3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to

provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."

4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
  - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- B. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- C. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### 3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

## SECTION 260553 - 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 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME 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.

- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.
- B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
  - 1. Color shall be factory applied.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  - 3. Colors for 240-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue
  - 4. Colors for 480/277-V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  - 5. Color for Neutral: White.
  - 6. Color for Equipment Grounds: Green.
  - 7. Colors for Isolated Grounds: Green with white stripe.
- C. Warning Label Colors:
  - 1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs 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 (915 MM)."

## 2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Champion America.
    - c. emedco.
    - d. Grafoplast Wire Markers.
    - e. HellermannTyton.
    - f. LEM Products Inc.
    - g. Marking Services, Inc.
    - h. Panduit Corp.
    - i. Seton Identification Products.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. HellermannTyton.
    - c. Marking Services, Inc.
    - d. Panduit Corp.
    - e. Seton Identification Products.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, polyester flexible label with acrylic pressure-sensitive adhesive.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. A'n D Cable Products.
    - b. Brady Corporation.
    - c. Brother International Corporation.
    - d. emedco.
    - e. Grafoplast Wire Markers.
    - f. Ideal Industries, Inc.
    - g. LEM Products Inc.
    - h. Marking Services, Inc.
    - i. Panduit Corp.
    - j. Seton Identification Products.
  2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.



3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. A'n D Cable Products.
    - b. Brady Corporation.
    - c. Brother International Corporation.
    - d. emedco.
    - e. Grafoplast Wire Markers.
    - f. HellermannTyton.
    - g. Ideal Industries, Inc.
    - h. LEM Products Inc.
    - i. Marking Services, Inc.
    - j. Panduit Corp.
    - k. Seton Identification Products.

## 2.4 BANDS AND TUBES

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameter and that stay in place by gripping action.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. HellermannTyton.
    - c. Marking Services, Inc.
    - d. Panduit Corp.

## 2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlton Industries, LP.
    - b. Champion America.
    - c. HellermannTyton.
    - d. Ideal Industries, Inc.

- e. Marking Services, Inc.
  - f. Panduit Corp.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. emedco.
    - d. Marking Services, Inc.
- C. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and is 12 inches (300 mm) wide. Stop stripes at legends.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. HellermannTyton.
    - b. LEM Products Inc.
    - c. Marking Services, Inc.
    - d. Seton Identification Products.
  - 2. Tape:
    - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
    - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
  - 3. Color and Printing:
    - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".

## 2.6 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.

- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
- I. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
- J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- L. Vinyl Wraparound Labels:
  - 1. Secure tight to surface at a location with high visibility and accessibility.
  - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- N. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- O. Self-Adhesive Labels:
  - 1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- P. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- Q. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- S. Write-on Tags:
1. Place in a location with high visibility and accessibility.
  2. Secure using plenum-rated cable ties.
- T. Baked-Enamel Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- U. Metal-Backed Butyrate Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- V. Laminated Acrylic or Melamine Plastic Signs:
1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- W. Cable Ties: General purpose, for attaching tags, except as listed below:
1. Outdoors: UV-stabilized nylon.
  2. In Spaces Handling Environmental Air: Plenum rated.
- 2.7 IDENTIFICATION SCHEDULE
- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

- C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.
- D. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive wraparound labels with the conductor designation.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- G. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- H. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- I. Equipment Identification Labels:
  - 1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
  - 2. Outdoor Equipment: Stenciled legend 4 inches (100 mm) high.

END OF SECTION 260553

## SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes: Distribution, dry-type transformers rated 600 V and less, with capacities up to 1500 kVA.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 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. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
  - 3. Include diagrams for power, signal, and control wiring.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Electric Corporation.
2. Eaton.
3. General Electric Company
4. Square D
5. Siemens.

## 2.2 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. 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.
- C. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.
  1. Coil Material: Copper.
- D. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

## 2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NFPA 70, and list and label as complying with UL 1561.
- B. Cores: One leg per phase.
- C. Enclosure: Ventilated.
  1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
- D. Transformer Enclosure Finish: Comply with NEMA 250.
  1. Finish Color: Gray.
- E. Taps for Transformers 3 kVA and Smaller: One 5 percent tap above normal full capacity.
- F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

## 2.4 IDENTIFICATION DEVICES

- A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

## 2.5 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- B. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.
- E. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
  - 1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- F. Secure transformer to concrete base according to manufacturer's written instructions.
- G. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.
- H. Remove shipping bolts, blocking, and wedges.

### 3.2 CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.



### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.
- B. Remove and replace units that do not pass tests or inspections and retest as specified above.
- C. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
  - 1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
  - 2. Perform two follow-up infrared scans of transformers, one at four months and the other at 11 months after Substantial Completion.
  - 3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

### 3.4 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.
- C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 262200

## SECTION 262413 - SWITCHBOARDS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

##### B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Detail utility company's metering provisions with indication of approval by utility company.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include schematic and wiring diagrams for power, signal, and control wiring.

#### 1.3 CLOSEOUT SUBMITTALS

##### A. Operation and maintenance data.

#### 1.4 QUALITY ASSURANCE

##### A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

## 1.5 FIELD CONDITIONS

### A. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
  - b. Altitude: Not exceeding 6600 feet (2000 m).

## 1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Three years from date of Substantial Completion.
- B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SWITCHBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Eaton.
  2. General Electric Company.
  3. Siemens Industry, Inc., Energy Management Division.
  4. Square D; by Schneider Electric.
- B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Comply with NEMA PB 2.
- E. Comply with NFPA 70.

- F. Comply with UL 891.
- G. Front-Connected, Front-Accessible Switchboards:
  - 1. Main Devices: Panel mounted.
  - 2. Branch Devices: Panel mounted.
  - 3. Sections front and rear aligned.
- H. Nominal System Voltage: 480Y/277 V.
- I. Main-Bus Continuous: 800 A.
- J. Indoor Enclosures: Steel, NEMA 250, Type 1.
  - 1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
- K. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.
- L. Buses and Connections: Three phase, four wire unless otherwise indicated.
  - 1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
  - 2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
  - 3. Tin-plated aluminum feeder circuit-breaker line connections.
  - 4. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
  - 5. Disconnect Links:
    - a. Isolate neutral bus from incoming neutral conductors.
    - b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
  - 6. Neutral Buses: 50 percent of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

## 2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. 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.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
  - a. Instantaneous trip.
  - b. Long- and short-time pickup levels.
  - c. Long and short time adjustments.
  - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
  - a. Standard frame sizes, trip ratings, and number of poles.
  - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
  - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
  - d. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

### 2.3 IDENTIFICATION

- A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.
- B. Install switchboards and accessories according to NEMA PB 2.1.
- C. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
  1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches (50-mm) above concrete base after switchboard is anchored in place.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
  3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  5. Install anchor bolts to elevations required for proper attachment to switchboards.
  6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.
- E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- F. Install filler plates in unused spaces of panel-mounted sections.
- G. Install overcurrent protective devices, surge protection devices, and instrumentation.
1. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Comply with NECA 1.
- I. Comply with requirements for terminating feeder bus specified in Section 262500 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.
- J. Comply with requirements for terminating cable trays specified in Section 260536 "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.

### 3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Acceptance Testing:
    - a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
    - b. Test continuity of each circuit.
  - 2. Test ground-fault protection of equipment for service equipment per NFPA 70.
  - 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Switchboard will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

## SECTION 262416 - PANELBOARDS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.

#### 1.2 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.
- B. SPD: Surge protective device.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for series rating of installed devices.
  - 6. Include evidence of NRTL listing for SPD as installed in panelboard.
  - 7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 8. Include wiring diagrams for power, signal, and control wiring.
  - 9. Key interlock scheme drawing and sequence of operations.
  - 10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.



## 1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
  - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PANELBOARDS COMMON REQUIREMENTS

- 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 NEMA PB 1.
- C. Comply with NFPA 70.
- D. Enclosures: Flush and Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor Locations: NEMA 250, Type 3R.
  - 2. Height: 84 inches (2.13 m) maximum.
  - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
  - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- E. Incoming Mains Location: Top.
- F. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- G. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
  - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
  - 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- H. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

- I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

## 2.2 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. Siemens Industry, Inc., Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  - 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: Circuit breaker.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices: Fused switches.

## 2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. Siemens Industry, Inc., Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

- F. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.

#### 2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. Siemens Industry, Inc., Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Electronic Trip Circuit Breakers:
    - a. RMS sensing.
    - b. Field-replaceable rating plug or electronic trip.
    - c. Digital display of settings, trip targets, and indicated metering displays.
    - d. Multi-button keypad to access programmable functions and monitored data.
    - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
    - f. Integral test jack for connection to portable test set or laptop computer.
    - g. Field-Adjustable Settings:
      - 1) Instantaneous trip.
      - 2) Long- and short-time pickup levels.
      - 3) Long and short time adjustments.
      - 4) Ground-fault pickup level, time delay, and I squared T response.
  - 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  - 5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
  - 6. Subfeed Circuit Breakers: Vertically mounted.
  - 7. MCCB Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Breaker handle indicates tripped status.
    - c. UL listed for reverse connection without restrictive line or load ratings.

- d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
- e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
- f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
- g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

## 2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NEMA PB 1.1.
- C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box.
- E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
- G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- H. Install filler plates in unused spaces.
- I. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-EMT) empty conduits into raised floor space or below slab not on grade.

- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- C. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers 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.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

## SECTION 262726 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Straight-blade convenience receptacles.
2. GFCI receptacles.
3. Toggle switches.
4. Wall plates.

#### 1.2 DEFINITIONS

##### A. Abbreviations of Manufacturers' Names:

1. Cooper: Copper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

## PART 2 - PRODUCTS

### 2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, 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.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.
- D. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

### 2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

### 2.3 GFCI RECEPTACLES

- A. General Description:
  - 1. 125 V, 20 A, straight blade, feed-through type.
  - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
  - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Eaton (Arrow Hart).
- b. Hubbell Incorporated; Wiring Device-Kellems.
- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).

## 2.4 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
  - 1. Single Pole:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
- C. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
- D. Toggle Switches: Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

## 2.5 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.



3. Material for Unfinished Spaces: Galvanized steel.
  4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

## 2.6 FINISHES

- A. Device Color:
1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
1. Protect installed devices and their boxes. 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 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 right 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. Pig-tailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that 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 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by 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 down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. GFCI Receptacles: Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

### 3.2 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Perform the following tests and inspections:

1. Tests for Convenience Receptacles:
  - a. Line Voltage: Acceptable range is 105 to 132 V.
  - b. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
  - c. Ground Impedance: Values of up to 2 ohms are acceptable.
  - d. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - e. Using the test plug, verify that the device and its outlet box are securely mounted.

- f. 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 ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262726

## SECTION 265119 - LED INTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes the following types of LED luminaires:
  - 1. Downlight.
  - 2. Recessed linear.
  - 3. Strip light.
  - 4. Surface mount, linear.
  - 5. Materials.
  - 6. Finishes.
  - 7. Luminaire support.

#### 1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, arranged by designation.
- B. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved:
- B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of luminaire.
- D. Sample warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

#### 1.7 LUMINAIRE REQUIREMENTS

- 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. Standards:
  - 1. ENERGY STAR certified.
  - 2. Recessed luminaires shall comply with NEMA LE 4.
- C. CRI of minimum 80. CCT of reference fixture schedule.
- D. Rated lamp life of 35,000 hours to L70.
- E. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- F. Internal driver.
- G. Nominal Operating Voltage: 120 V ac and or 277 V ac.
  - 1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- H. Housings:
  - 1. Extruded-aluminum housing and heat sink.
  - 2. painted finish.

## 1.8 LUMINARIES

- A. Manufacturers: Subject to compliance with requirements, provide products as indicated in the fixture schedule.

## 1.9 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

## 1.10 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

## PART 2 - EXECUTION

### 2.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports: Sized and rated for luminaire weight.
- E. Flush-Mounted Luminaire Support: Secured to outlet box.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
  - 2. Do not attach luminaires directly to gypsum board.
- G. Suspended Luminaire Support:
  - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.

2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

J. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

## 2.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 265119

## SECTION 265219 - EMERGENCY AND EXIT LIGHTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Emergency lighting units.
  - 2. Exit signs.
  - 3. Luminaire supports.

#### 1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Emergency Lighting Unit: A lighting unit with integral or remote emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Fixture: See "Luminaire" Paragraph.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support, arranged by designation.
- B. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, coordinated with each other, using input from installers of the items involved:
- B. Product Certificates: For each type of luminaire.



- C. Sample Warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

## 1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two year(s) from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- 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. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with NFPA 70 and NFPA 101.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for recessed luminaires.
- F. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.
  - 1. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    - a. Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
    - b. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
    - c. Humidity: More than 95 percent (condensing).
    - d. Altitude: Exceeding 3300 feet (1000 m).
  - 2. Test Push-Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

- a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
  - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
3. Battery: Sealed, maintenance-free, nickel-cadmium type.
  4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
  5. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
  6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

## 2.2 EMERGENCY LIGHTING

- A. General Requirements for Emergency Lighting Units: Self-contained units.
- B. Emergency Luminaires and or lighting units:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following listed in the light fixture schedule.
  2. Emergency Luminaires: as indicated on Interior Lighting Fixture Schedule, with the following additional features:
    - a. Internal emergency power unit.
    - b. Rated for installation in damp locations, and for sealed and gasketed fixtures in wet locations.

## 2.3 EXIT SIGNS

- A. Internally Lighted Signs:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following listed in the light fixture schedule.
  2. Operating at nominal voltage of 120 or 277 volts.
  3. AC Operation: LEDs; 50,000 hours minimum rated lamp life.
  4. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

## 2.4 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position when testing emergency power unit.
  - 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
  - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of fixture weight.
- E. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
  - 2. Do not attach fixtures directly to gypsum board.
- F. Suspended Luminaire Support:
  - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of fixture oscillations. Support outlet box vertically to building structure using approved devices.
  - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
  - 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- G. Ceiling Grid Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
- H. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 265219

## SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Fire alarm wire and cable.
  - 2. Identification products.

#### 1.2 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Cabling administration drawings and printouts.
  - 2. Wiring diagrams to show typical wiring schematics.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

### PART 2 - PRODUCTS

- 2.1 Manufacturers and products listed in SpecAgent and Masterworks Paragraph Builder are neither recommended nor endorsed by the AIA or ARCOM. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in

descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

## 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.
- B. 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.

## 2.3 FIRE ALARM WIRE AND CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Allied Wire & Cable Inc.
  - 2. CommScope, Inc.
  - 3. Comtran Corporation.
  - 4. Draka Cableteq USA; a Prysmian Group company.
  - 5. Genesis Cable Products; Honeywell International, Inc.
  - 6. Radix Wire.
  - 7. Rockbestos-Suprenant Cable Corp.
  - 8. Superior Essex Inc.
  - 9. West Penn Wire.
- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG or size as recommended by system manufacturer.
  - 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.
- D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
  - 1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
  - 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
  - 3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NRTL listed for fire alarm and cable tray installation, plenum rated.

## 2.4 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Brady Corporation.
  - 2. HellermannTyton.
  - 3. Kroy LLC.
  - 4. Panduit Corp.
- B. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Comply with requirements in Section 260553 "Identification for Electrical Systems."

## 2.5 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical-fiber cables on reels according to TIA-568-C.1.
- C. Factory test UTP cables according to TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

### 3.2 WIRING METHOD

- A. Install cable, concealed in accessible ceilings, walls, and floors when possible.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

D. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-C recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communication cables or cables in nonmetallic pathways and unshielded power conductors and electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
3. Separation between communication cables in grounded metallic pathways and unshielded power lines or electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
4. Separation between cables in grounded metallic pathways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or hp and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 280528 "Pathways for Electronic Safety and Security."
  1. Install plenum cable in environmental air spaces, including plenum ceilings.
  2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.
- C. Wiring Method:



1. Cables and pathways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
  2. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is not permitted.
  3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or pathway as signaling line circuits.
- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- F. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and another for supervisory circuits. Color code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
- H. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

### 3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

- A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
- B. Minimum Conductor Sizes:
1. Class 1 remote-control and signal circuits, No. 14 AWG.
  2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
  3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

### 3.6 CONNECTIONS

- A. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

### 3.7 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-C, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.8 GROUNDING

- A. For communication wiring, comply with J-STD-607-A and with BICSI TDMM's "Grounding, Bonding, and Electrical Protection" chapter.

### 3.9 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.10 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Visually inspect UTP and optical-fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
  - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
    - a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 280513

## SECTION 280528 - PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetallic conduits, tubing, and fittings.
3. Surface pathways.
4. Boxes, enclosures, and cabinets.

##### B. Related Requirements:

1. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets.

### PART 2 - PRODUCTS

#### 2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. AFC Cable Systems; a part of Atkore International.
  2. Allied Tube & Conduit; a part of Atkore International.
  3. Alpha Wire.
  4. Anamet Electrical, Inc.
  5. Electri-Flex Company.
  6. O-Z/Gedney; a brand of Emerson Industrial Automation.
  7. Picoma Industries, Inc.
  8. Plasti-Bond.
  9. Republic Conduit.
  10. Southwire Company.
  11. Thomas & Betts Corporation; A Member of the ABB Group.
  12. Western Tube and Conduit Corporation.
  13. Wheatland Tube Company.

- B. General Requirements for Metal Conduits and Fittings:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Comply with TIA-569-B.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. EMT: Comply with ANSI C80.3 and UL 797.
- F. FMC: Comply with UL 1; zinc-coated steel.
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
  - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
  - 2. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: Setscrew.
  - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
- H. Joint Compound for GRC or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. See manufacturers listed in section 2.1.A.
- B. General Requirements for Nonmetallic Conduits and Fittings:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Comply with TIA-569-B.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. Continuous HDPE: Comply with UL 651B.
- F. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

- G. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.3 SURFACE PATHWAYS

### A. General Requirements for Surface Pathways:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

### B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MonoSystems, Inc.
  - b. Niedax Inc.
  - c. Panduit Corp.
  - d. Wiremold / Legrand.

### C. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Lamson & Sessions.
  - b. MonoSystems, Inc.
  - c. Panduit Corp.
  - d. Quazite: Hubbell Power Systems, Inc.
  - e. Wiremold / Legrand.

### D. Tele-Power Poles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MonoSystems, Inc.
  - b. Panduit Corp.
  - c. Wiremold / Legrand.
2. Material: Galvanized steel with baked-enamel finish.
3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

## 2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Adalet.
  2. Crouse-Hinds, an Eaton business.
  3. EGS/Appleton Electric.
  4. Erickson Electrical Equipment Company.
  5. Hoffman; a brand of Pentair Equipment Protection.
  6. Lamson & Sessions.
  7. Milbank Manufacturing Co.
  8. Molex Premise Networks.
  9. MonoSystems, Inc.
  10. O-Z/Gedney; a brand of Emerson Industrial Automation.
  11. Plasti-Bond.
  12. Quazite: Hubbell Power Systems, Inc.
  13. RACO; Hubbell.
  14. Spring City Electrical Manufacturing Company.
  15. Stahlin Non-Metallic Enclosures.
  16. Thomas & Betts Corporation; A Member of the ABB Group.
  17. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets:
1. Comply with TIA-569-B.
  2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- F. Metal Floor Boxes:
1. Material: Cast or sheet metal.
  2. Type: Fully adjustable.
  3. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- K. Gangable boxes are prohibited.
- L. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic or fiberglass.
  - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- N. Cabinets:
  - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.
  - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## PART 3 - EXECUTION

### 3.1 PATHWAY APPLICATION

- A. Indoors: Apply pathway products as specified below unless otherwise indicated:
  - 1. Exposed, Not Subject to Physical Damage: EMT.
  - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
  - 3. Exposed and Subject to Severe Physical Damage: GRC.
  - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric-Solenoid, or Motor-Driven Equipment): FMC.
  - 6. Damp or Wet Locations: GRC.
  - 7. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- B. Minimum Pathway Size: 1/2-inch (16-mm) trade size. Minimum size for optical-fiber cables is 1 inch (27 mm).
- C. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. EMT: Use setscrew, fittings. Comply with NEMA FB 2.10.
  3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface pathways only where indicated on Drawings.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

### 3.2 INSTALLATION

- A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- B. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications wiring conduits for which only two 90-degree bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- F. Pathways Embedded in Slabs:
1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.
  2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
  3. Arrange pathways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
  4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- G. Stub-ups to Above Recessed Ceilings:
1. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.



- H. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- I. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
- J. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- K. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to conduit assembly to assure a continuous ground path.
- L. Spare Pathways: Install pull wires in empty pathways. Cap underground pathways designated as spare above grade alongside pathways in use.
- M. Surface Pathways:
  - 1. Install surface pathway for surface electrical outlet boxes only where indicated on Drawings.
- N. Pathways for Optical-Fiber and Communications Cable: Install pathways as follows:
  - 1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
  - 2. 1-Inch (27-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
  - 3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements.
- O. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound.
- P. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where an underground service pathway enters a building or structure.
  - 3. Where otherwise required by NFPA 70.
- Q. Expansion-Joint Fittings:
  - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
  - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

- a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
  - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
  - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- R. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
- S. Mount boxes at heights indicated on Drawings according to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- T. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- 3.3 FIRESTOPPING
- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."
- 3.4 PROTECTION
- A. Protect coatings, finishes, and cabinets from damage and deterioration.

END OF SECTION 280528

## SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Remote annunciator.
8. Addressable interface device.
9. Digital alarm communicator transmitter.

##### B. Related Requirements:

1. Section 280513 "Conductors and Cables for Electronic Safety and Security" for cables and conductors for fire-alarm systems.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of product, including furnished options and accessories.

##### B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

- a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
- b. Show field wiring required for HVAC unit shutdown on alarm.
- c. Locate detectors according to manufacturer's written recommendations.

C. General Submittal Requirements:

1. Layout of fire alarm devices is shown for reference and coordination only. The Contractor shall be the Designer of Record and as such, the Contractor shall be responsible to verify device layouts comply with all applicable codes and shall include in bid all cost associated with additional devices should they be required.
2. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
1. Shop Drawings shall be prepared by persons with the following qualifications:
  - a. Trained and certified by manufacturer in fire-alarm system design.
  - b. NICET-certified, fire-alarm technician; Level III minimum.
  - c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample warranty.

### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
  1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:

- a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
- c. Complete wiring diagrams showing connections between all devices and equipment.
- d. Riser diagram.
- e. Record copy of site-specific software.
- f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
  - 1) Equipment tested.
  - 2) Frequency of testing of installed components.
  - 3) Frequency of inspection of installed components.
  - 4) Requirements and recommendations related to results of maintenance.
  - 5) Manufacturer's user training manuals.
- g. Manufacturer's required maintenance related to system warranty requirements.
- h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

- 1. Software operating and upgrade manuals.
- 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
- 3. Device address list.
- 4. Printout of software application and graphic screens.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.
- C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).
- D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.

2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.
- B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.
- C. Automatic sensitivity control of certain smoke detectors.
- D. All components provided shall be listed for use with the selected system.
- E. 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.

### 2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
  1. Manual stations.
  2. Smoke detectors.
  3. Duct smoke detectors.
  4. Automatic sprinkler system water flow.
  5. Fire standpipe system.
- B. Fire-alarm signal shall initiate the following actions:
  1. Continuously operate alarm notification appliances.
  2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
  3. Transmit an alarm signal to the remote alarm receiving station.
  4. Unlock electric door locks in designated egress paths.
  5. Release fire and smoke doors held open by magnetic door holders.
  6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
  7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
  8. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
  1. Open circuits, shorts, and grounds in designated circuits.
  2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.

3. Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

## 2.3 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fike Corporation.
2. Fire-Lite Alarms, Inc.; a Honeywell International company.
3. Gamewell - FCI by Honeywell.
4. GE UTC Fire & Security; A United Technologies Company.
5. Notifier.
6. Siemens Industry, Inc.; Fire Safety Division.
7. Silent Knight.
8. SimplexGrinnell LP.

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

- D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
1. Pathway Class Designations: NFPA 72, Class B.
  2. Pathway Survivability: Level 0.
- E. Notification-Appliance Circuit:
1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
  2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
  3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.
- F. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory.
- G. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- H. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals shall be powered by 24-V dc source.
1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- I. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

#### 2.4 MANUAL FIRE-ALARM BOXES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AMSECO - A Potter Brand.
  2. Bosch Security Systems, Inc.
  3. Faraday.
  4. Federal Signal Corporation.
  5. Fike Corporation.
  6. Fire-Lite Alarms, Inc.; a Honeywell International company.
  7. Gamewell - FCI by Honeywell.
  8. GE UTC Fire & Security; A United Technologies Company.
  9. Keltron Corporation.
  10. Mircom Technologies, Ltd.
  11. Notifier.



12. Potter Electric Signal Company, LLC.
13. Siemens Industry, Inc.; Fire Safety Division.
14. Silent Knight.
15. SimplexGrinnell LP.
16. System Sensor.
17. Wheelock; a brand of Eaton.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38.

1. Single-action mechanism, breaking-glass or plastic-rod pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

## 2.5 SYSTEM SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bosch Security Systems, Inc.
2. Faraday.
3. Fenwal Protection Systems; A UTC Fire & Security Company.
4. Fire-Lite Alarms, Inc.; a Honeywell International company.
5. Gamewell - FCI by Honeywell.
6. GE UTC Fire & Security; A United Technologies Company.
7. Gentex Corporation.
8. Harrington Signal, Inc.
9. Keltron Corporation.
10. Mircom Technologies, Ltd.
11. Notifier.
12. Siemens Industry, Inc.; Fire Safety Division.
13. Silent Knight.
14. SimplexGrinnell LP.
15. System Sensor.

B. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

C. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

## 2.6 NOTIFICATION APPLIANCES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Federal Signal Corporation.
  2. GE UTC Fire & Security; A United Technologies Company.
  3. Gentex Corporation.
  4. Harrington Signal, Inc.
  5. Keltron Corporation.
  6. Mircom Technologies, Ltd.
  7. Potter Electric Signal Company, LLC.
  8. Siemens Industry, Inc.; Fire Safety Division.
  9. SimplexGrinnell LP.
  10. System Sensor.
  11. Wheelock; a brand of Eaton.

- B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
  - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- C. Chimes: Vibrating type.
- D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464.
- E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
  - 1. Mounting: Wall mounted unless otherwise indicated.
  - 2. Flashing shall be in a temporal pattern, synchronized with other units.
  - 3. Strobe Leads: Factory connected to screw terminals.
  - 4. Mounting Faceplate: Factory finished, red.

## 2.7 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
  - 1. Mounting: Flush cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

## 2.8 ADDRESSABLE INTERFACE DEVICE

- A. General:
  - 1. Include address-setting means on the module.
  - 2. Store an internal identifying code for control panel use to identify the module type.
  - 3. Listed for controlling HVAC fan motor controllers.
- B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- C. Integral Relay: Capable of providing a direct signal to circuit-breaker shunt trip for power shutdown.
  - 1. Allow the control panel to switch the relay contacts on command.

2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.9 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.
- B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
- C. Local functions and display at the digital alarm communicator transmitter shall include the following:
  1. Verification that both telephone lines are available.
  2. Programming device.
  3. LED display.
  4. Manual test report function and manual transmission clear indication.
  5. Communications failure with the central station or fire-alarm control unit.
- D. Digital data transmission shall include the following:
  1. Address of the alarm-initiating device.
  2. Address of the supervisory signal.
  3. Address of the trouble-initiating device.
  4. Loss of ac supply.
  5. Loss of power.
  6. Low battery.
  7. Abnormal test signal.
  8. Communication bus failure.
- E. Secondary Power: Integral rechargeable battery and automatic charger.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

## PART 3 - EXECUTION

## 3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
- C. Equipment Mounting: Install fire-alarm control unit on finished floor.
  - 1. Comply with requirements for seismic-restraint devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.
  - 1. Comply with requirements for seismic-restraint devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Manual Fire-Alarm Boxes:
  - 1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
  - 2. Mount manual fire-alarm box on a background of a contrasting color.
  - 3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- F. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.
- G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.
- H. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- I. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.
- K. Device Location-Indicating Lights: Locate in public space near the device they monitor.

### 3.2 PATHWAYS

- A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.
  - 1. Exposed pathways located less than 96 inches (2440 mm) above the floor shall be installed in EMT.
- B. Pathways shall be installed in EMT.
- C. Exposed EMT shall be painted red enamel.

### 3.3 CONNECTIONS

### 3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

### 3.5 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

### 3.6 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.
    - a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter.
    - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
  - 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
  - 3. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72

and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

- C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

### 3.7 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
  - 1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

### 3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

## SECTION 311000 - SITE CLEARING

### 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. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing existing trees and vegetation
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning existing site utilities in place and/or removing existing site utilities when indicated.
7. Temporary erosion and sedimentation control measures.

- B. Related Sections include the following:

1. Division 01 Section "Temporary Controls and Facilities" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities.
2. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.
3. Division 02 Section "Structure Demolition" for demolition of buildings and/or structures.
4. Division 02 Section "Selective Structure Demolition" for partial demolition of buildings and/or structures.

#### 1.3 DEFINITIONS

- A. Subsoil: All soil beneath topsoil, as defined below, and typified by the lack of organic matter and soil organisms.
- B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.
  1. Existing topsoil may require screening or amendment before being considered suitable for planting soil mix requirements..
- C. Tree Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.



- D. Vegetation: Trees, shrubs, groundcover, grass, and other plants.
- E. Best Management Practices (BMP's) means schedules of activities, prohibition of practices, maintenance procedures, and other management practices to prevent or reduce pollution. BMP's also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

#### 1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, all cleared materials shall become Contractor's property and shall be removed from Project site.
- B. Removed material shall be disposed of on legally approved sites and in compliance with requirements of regulatory agencies.

#### 1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for the following:
  - 1. Silt fence fabric.
  - 2. Non-woven geotextiles.
- C. Reports, records, and certifications required by this Section, regulatory agencies having jurisdiction, and permit requirements.

#### 1.6 PROJECT CONDITIONS

- A. Construction operations are to be limited to the project property only. Trespassing of workers, equipment, or materials onto adjacent properties, and not covered by a access or utility easement, is strictly forbidden.
- B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises as directed.
- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

- E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.
- F. The following practices are prohibited within tree protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."
  - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.
  - 2. Submit product data information on proposed off-site borrow materials according to the requirements specified in Division 31 Section "Earth Moving."

### 2.2 EROSION CONTROL DEVICE MATERIALS

- A. Anti-Erosion Mulch: Clean, dry straw of winter wheat, rye, oats, or barley.
- B. Silt Fence Fabric: Synthetic filter fabric or a pervious sheet of polypropylene, nylon, polyester, or polyethylene yarn, 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. Filtering efficiency: Not less than 75 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 0.20 gallons per square foot per minute.
  - 4. Ultraviolet radiation stability: 90%
- C. Silt Fence Posts: Contractor has option of the following.
  - 1. 4 inch diameter pine.
  - 2. 2 inch diameter oak.

3. Plastic posts designed to be specially incorporated into, or work with, a silt fence fabrication.
- D. Temporary Seeding: Annual plant or mixture of annual plant seeds, free of weed and invasive seeds, capable of providing temporary surface restoration.

### PART 3 - EXECUTION

#### 3.1 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.

#### 3.2 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain.
- C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition at no additional cost to Owner, as acceptable to Owner.
- D. 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.
- E. Moisten surfaces, as required, to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on Project Site.
- F. Install temporary construction entrances.

#### 3.3 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways according to requirements of authorities having jurisdiction.
- B. Install erosion control systems at the site's boundary at locations where storm water runoff will leave the site prior to starting any clearing, stripping, or earthwork operations
- C. Minimize the time areas are to be exposed without vegetative cover.

- D. Clearing and grubbing within 50 feet of a defined drainage way is strictly prohibited unless such activity is clearly indicated and then shall not commence until the specific erosion control systems and BMP's for that specific area are in place. Construction time within drainage ways shall be minimized.
- E. Properly dispose of solid waste, paints, solvents, cleaning compounds, etc.
- F. Store construction materials in designated areas away from drainage ways and low areas.
- G. Provide portable toilets and properly dispose of sanitary sewage.
- H. Construct containment berm and utilize drip pans at fuel and liquid storage tanks and containers.
- I. Minimize areas to be stripped to those areas of construction activity.
- J. Phase construction operations to minimize area of disturbed soil.
- K. Exposed surfaces shall be roughened to inhibit runoff and promote infiltration.
- L. At completion of topsoil stockpiling operations, stockpiles shall be shaped and graded to drain.
- M. Installation of Erosion Control Devices
  - 1. Install erosion control devices to protect adjacent and downstream properties from damage and pollution resulting from erosion caused by the work of this Contract.
  - 2. Implement erosion control measures and additional erosion control measures necessary to prevent damage to adjacent and downstream properties.
  - 3. Install additional erosion control devices as required by the municipality having jurisdiction.
  - 4. Install silt fence located along perimeter of site or grading limits immediately following site clearing and grading operations.
    - a. Install silt fence fabric from a continuous roll for the length of the silt fence whenever possible to minimize the number of joints.
    - b. Create joints in fabric by securely fastening fabric at the support post with overlap extending to the next post.
    - c. Drive support post into ground not less than 24 inches.
    - d. Excavate a 4 inch wide by 6 inch deep trench on up-slope side of silt fence.
    - e. Line trench with silt fence fabric material.
    - f. Backfill trench with soil or gravel.
  - 5. Install sediment traps at curb inlets.
  - 6. Install concrete wash pits.
  - 7. Establish temporary vegetative cover in areas that are not disturbed for a period of 14 days.
- N. Inspection of Erosion and Sediment Control Systems
  - 1. Inspect all erosion control systems and devices at least once every seven calendar days.

2. Inspect all erosion control systems and devices within 24 hours of the end of any rainfall event which results in precipitation of 1/2 inch or more.
3. During inspections, locations where storm water leaves the site shall be inspected for evidence of erosion or sediment deposition.
4. Correct deficiencies within three calendar days.
5. Complete a report of each inspection. Report shall contain the following minimum information:
  - a. Inspector's name
  - b. Inspection date
  - c. Observations of the effectiveness of erosion control systems
  - d. Actions taken if necessary to correct deficiencies
  - e. Listing of areas where construction operations have permanently or temporarily stopped
  - f. Authorized signature

O. Maintenance of Erosion and Sediment Control Devices

1. Check all erosion control measures after each rainfall event to ensure that they are in proper working order.
  - a. Immediately restore all measures to installed condition.
2. Inspect erosion control fences at least once a week.
3. Immediately replace damaged portions of the erosion control fences, including portions which have collapsed, contain tears, have decomposed, or have become ineffective.
4. Remove sediment deposits, as necessary, to provide adequate sediment storage and to maintain the integrity of fences. Dispose of accumulated sediment by spreading over upland areas of the site.
5. Maintain erosion control devices in place, as specified, until completion of the work of this Contract and until permanent stabilization of all disturbed areas is achieved.
  - a. At completion of work, inspect all systems, make necessary repairs, remove and dispose of all accumulated sediment, and turn completely operable systems indicated to remain over to Owner for continued maintenance.

P. Remove erosion and sedimentation controls not indicated to remain and restore and stabilize areas disturbed during removal.

Q. Chemical and sewage spills

1. Report hazardous substance or oil spills in accordance with requirements of 40 CFR 117 and 40 CFR 302.
2. Report discharge or escape of sewage, substances, or waste which may contaminate or pollute water or soil to the Missouri Department of Natural Resources.

R. Removed Substances

1. Solids, sludges, sediments, or other pollutants removed in the control of runoff shall be managed in accordance with applicable statutes and regulations.

### 3.4 EXISTING UTILITIES

- A. Arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing. Coordinate disconnection with Owner as necessary.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
- C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.

### 3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain.
  - 2. Grind stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
  - 3. Chip removed tree branches and dispose of off-site.
  - 4. Use hand methods only for grubbing within tree protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material according to the requirements specified in Division 31 Specification "Earth Moving."

### 3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Install additional erosion control devices at stockpile areas.
  - 2. Stockpile surplus topsoil for respreading following final grading operations.
  - 3. Dispose of excess topsoil as specified for waste material disposal.
  - 4. Dispose of excess topsoil as directed by Owner.

### 3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Remove concrete walks and sidewalks to nearest joint beyond line of demolition.
  - 2. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
  - 3. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

### 3.8 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 1000

## SECTION 312000 – EARTH MOVING

## 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.
- B. Standards and requirements of the City of Kansas City (KCMO).

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage fill for slabs-on-grade.
  - 4. Granular Base course for pavements.
  - 5. Subsurface drainage backfill for walls and trenches.
  - 6. Excavating and backfilling trenches within building lines.
  - 7. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
  - 1. Division 01 Section "Construction Facilities and Temporary Controls."
  - 2. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
  - 3. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removing topsoil above- and below-grade improvements including utilities, and protecting trees to remain.
  - 4. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

## 1.3 DEFINITIONS

- A. Authorized Additional Excavation: Removing materials beyond indicated subgrade elevations and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the work.
- B. Backfill: Soil 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.



- C. Granular Base Course: The layer placed between the subgrade and pavement in a paving system.
- D. Bedding Material: Granular material utilized to bed piped utilities placed in trench excavations.
- E. Borrow Material: Material obtained off-site use for fill or backfill when sufficient approved soil material is not available from excavations.
- F. Controlled Low Strength Material: Low-strength concrete, commonly referred to as “Flowable Fill.”
- G. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to minimize upward capillary flow of pore water.
- H. Excavation: The removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.
- I. Fill: Soil material used to raise elevations.
- J. Impermeable Clay Soil: Soil material having characteristics which inhibit the flow of water.
- K. Low Volume Change Soil Material: Low-plasticity soil material.
- L. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- M. Subgrade: The uppermost surface of an excavation, including excavation for trenches, or the top surface of a fill or backfill immediately below base course, pavement, drainage fill, or top-soil materials.
- N. Subsurface Drainage Backfill: Granular material utilized to backfill walls or utilized to backfill subsurface trench drainage systems.
- O. Unauthorized Excavation: Removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
- P. Unforeseen Excavation: Excavation of material, regardless of its character or nature, below the subgrade elevation required to construct the work as indicated on the drawings or specified herein. Unforeseen excavation shall be at the Contractor’s expense.
- Q. Utilities: Underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

#### 1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specifications.
- B. Product Data: For the following:

1. Each type of plastic warning tape.
  2. Geotextile drainage fabric.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
  2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.
- D. Photographs of existing adjacent structures and site improvements, for record purposes only.

#### 1.5 QUALITY ASSURANCE

- A. Pre-Excavation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
- B. Codes and Standards: Perform earth moving operations complying with requirements of authorities having jurisdiction.
- C. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soil materials to verify that soils comply with specified requirements and to perform required field and laboratory testing.

#### 1.6 PROJECT CONDITIONS

- A. The existing utility information shown on the Drawings is based on the best available information. The exact location and depth of these utilities are unknown. Contractor shall perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located. Contractor to notify Architect in writing should existing utilities be discovered.
- B. Site Information: Reports on subsurface condition investigations made during design of Project are available and are for informational purposes only. Data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.
- C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Architect's written permission.
  3. Contact utility-locator service for area where Project is located before excavating.
- E. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures are in place.
- F. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.
- G. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
  2. Parking vehicles or equipment.
  3. Foot traffic.
  4. Erection of sheds or structures.
  5. Impoundment of water.
  6. Excavation or other digging unless otherwise indicated.
  7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- H. Do not direct vehicle or equipment exhaust towards protection zones.
- I. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- J. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- K. Utilities have been located from surveys and available existing records. Not all utilities may be shown on the Drawings. Locate all utilities prior to beginning any construction activities.
- L. Where utilities require adjustment or relocation to construct the Work, and those utilities are not shown on the Drawings, notify Architect before proceeding. Relocate or adjust utility as directed. All utility adjustment and/or relocation work shall be at the Contractor's expense, regardless if the utilities are shown on the Plans or not.
- M. If utility is damaged by Contractor, notify utility owner and Architect immediately. Repair or replacement of utilities damaged by Contractor, whether utilities are shown on the drawings or not shown on the drawings, shall be Contractor's expense.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GC, GW, GP, GM, SC, SW, SP, SM, ML, MH and CL or CH or a combination of these group symbols; free of rock or gravel

larger than 2 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups OL, OH, and PT, or a combination of these group symbols.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Structural Fill: Satisfactory soils meeting the requirements of the Geotechnical Engineering Report and subject to acceptance by the Owner's Testing and Inspection Service.
- E. Granular Base Course: Crushed limestone aggregate meeting the requirements of MoDOT Type 5 material.
- F. Bedding Course: Clean, granular materials of crushed rock or pea gravel with not less than 95 percent passing a 3/4 inch sieve and not less than 95 percent retained on a 3/8 inch sieve.
- G. Controlled Low Strength Material: Concrete mix meeting the requirements of KCMO Specification Section 2602.I.
- H. Drainage Fill: Crusher-run limestone or rock dust meeting the requirements of the Geotechnical Engineering Report and subject to acceptance by the Owner's Testing and Inspection Service.
- I. Clean Drainage Fill: Clean, open-graded crushed limestone aggregate meeting the requirements of Geotechnical Engineering Report and subject to acceptance by the Owner's Testing and Inspection Service.
- J. Subsurface Drainage Backfill Material: Clean, open-graded crushed limestone aggregate meeting the requirements of MoDOT Grade 4 aggregate per MoDOT Specification Section 1009.
- K. Impermeable Clay Soil: Clay soils capable of compacting to a dense state and inhibiting the flow of water. Specific material requirements of Impermeable Clay Soil are subject to compliance by the Owner's Testing and Inspection Service.
- L. Low Volume Change Soil Material: Low plasticity cohesive soils having a liquid limit less than 50 and a plasticity index less than 25, or well-graded granular materials, approved by Owner's Testing and Inspection Service

## 2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
  - 1. Red: Electric.
  - 2. Yellow: Gas, oil, steam, and dangerous materials.
  - 3. Orange: Telephone and other communications.

4. Blue: Water systems.
  5. Green: Sewer systems.
- B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Grab Tensile Strength: 110 lbf; ASTM D 4632.
  2. Tear Strength: 40 lbf; ASTM D 4533.
  3. Puncture Resistance: 50 lbf; ASTM D 4833.
  4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.
  5. Apparent Opening Size: No. 50; ASTM D 4751.
- C. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
  2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
  3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
  4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
  5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
  2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

### 3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

### 3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation is unclassified and includes excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Borrow Material: If excavated materials of a suitable nature are not of sufficient quantity to complete the work, provide borrow material in sufficient quantity to complete the work at no additional cost to the Owner.
- C. Disposition of Excavated Material: Dispose of excess satisfactory soil material and all unsatisfactory soil material and rock obtained from excavations in accordance with the provisions of this Section.

### 3.5 STABILITY OF EXCAVATIONS

- A. Comply with local, state, and federal codes, ordinances, and regulations regarding maintaining safe and stable excavations.

### 3.6 EXCAVATION FOR BUILDING AREA

- A. Excavation for the building area, extending a minimum of five feet beyond the building footprint, shall extend to a depth of 18-inches below the bottom of the Clean Drainage Fill course to be placed under the building slab. For the purposes of this contract the elevation of the surface at the completion of this excavation is the subgrade elevation for the building area.
- B. Following excavation to the above described subgrade elevation for the building area, the exposed subgrade scarified and recompact to a depth no less than 9 inches. The exposed subgrade shall then be evaluated by the Owner's Testing and Inspection Service. The Contractor shall be responsible for scheduling this subgrade evaluation.
- C. If, in the opinion of the Owner's Testing and Inspection Service, the subgrade materials are unsuitable, the unsuitable materials shall be removed to the extent and depth required by the Owner's Testing and Inspection Service and replaced with materials approved by, and placed in accordance with, the requirements of the Owner's Testing and Inspection Service.
  - 1. Excavation and disposal of unsuitable material below building subgrade elevation and replacement of that material with suitable material will be at the Contractor's expense.
  - 2. Excavation, utilization, and / or disposal of materials, whether suitable or unsuitable, to the building subgrade elevation is included in the Work of this Contract

### 3.7 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1.2 inches. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1.2 inches. Do not disturb bottom of excavations intended for bearing surface.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  - 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

### 3.8 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

### 3.9 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  - 1. Where utilities are in fill, compact fill material to 95% standard proctor maximum dry density at least 12" above the top of the proposed utility prior to excavation of trench.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
- C. Trench Bottoms when no bedding course is indicated: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.

3. If rock or other unyielding material is encountered at required trench bottom elevation, excavate trenches 6 inches deeper than subgrade elevation required to allow for installation of a 6 inch thick bedding course.
  - a. Excavation and disposal of rock or other unyielding material below required trench bottom elevation and replacement of that material with bedding material will be paid according to the Contract provisions for changes in the Work.
- D. Trench Bottoms when bedding course is indicated: Excavate trenches to depth below bottom of utility indicated to allow for bedding course. Hand excavate for bell of pipe.

### 3.10 APPROVAL OF SUBGRADE

- A. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Testing and Inspection Service at no additional cost to Owner.
- B. Notify Architect and Owner's Testing and Inspection Service when excavations have reached required subgrade.
- C. If Owner's Testing and Inspection Service determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
  1. Additional excavation and replacement material will be at the Contractor's expense.
- D. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades. Continue excavation of unsatisfactory material and replaced with compacted backfill or fill material as directed.
  1. Unforeseen additional excavation and replacement material will be at the Contractor's expense.

### 3.11 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Owner's Testing and Inspection Service.
  1. Fill unauthorized excavations under other construction or utility pipe as directed by Owner's Testing and Inspection Service.
- B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Owner's Testing and Inspection Service.
- C. All additional costs incurred as a result of unauthorized excavation are the Contractor's responsibility.

### 3.12 STORAGE OF SOIL MATERIALS



- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### 3.13 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for record documents.
  - 3. Inspecting and testing underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring and bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

### 3.14 UTILITY TRENCH BACKFILL WITHIN BUILDING LINES

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Backfill should consist of Impermeable Clay Soil and Controlled Low Strength Material.
  - a. Impermeable Clay Soil is to be placed in 6-inch maximum lifts and compacted to a minimum of 95 percent of the Standard Proctor maximum dry density at a moisture content within 3 percent of the optimum moisture content.
- C. Backfill should continue up to the bottom of the Drainage Fill.

### 3.15 UTILITY TRENCH BACKFILL OUTSIDE OF BUILDING LINES

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Coordinate backfilling with utilities testing and installation of warning tape.
  - a. Install warning tape directly above utility line, 12-inches below finished grade of 6-inches below subgrade under pavements and slabs.
- D. When excavation wall protection has been utilized, fill voids with approved materials while shoring and bracing, and as sheeting is removed.

- E. Place and compact initial backfill of material indicated, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- F. Place and compact final backfill of material indicated to final elevation required.

### 3.16 FILL, GENERAL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Scarify exposed subgrade to a depth of 9 inches. Moisture condition scarified depth of material to a moisture content within 3 percent of optimum moisture content. Re-compact scarified material to not less than 95 percent of Standard Proctor maximum dry density. Maintain moisture content within the limits specified above until placement of subsequent layers of fill material.
- D. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use “Satisfactory Soils” obtained from excavations or borrow sources.
  - 2. Under concrete pavements use “Aggregate Base Course” of thickness indicated with “Satisfactory Soils” obtained from excavations or borrow sources below the “Aggregate Base Course”.
  - 3. Under asphaltic concrete pavements use “Satisfactory Soils” obtained from excavations or borrow sources.
  - 4. Under footings and foundations, use “Structural Fill”.
- E. Place fill on subgrades free of mud, frost, snow, or ice.

### 3.17 FILL IN BUILDING AREA

- A. Fill in the building area, extending a minimum of five feet beyond the building footprint, shall be “Drainage Fill” for a depth of 18 inches below the bottom of the “Clean Drainage Fill” course.
  - 1. Place “Drainage Fill” in lifts not exceeding 6 inches and compact to at least 95 percent of the Standard Proctor maximum dry density at a moisture content sufficient to achieve this level of compaction.
- B. Place “Clean Drainage Fill” for a depth of 4 inches above the “Drainage Fill” and below the building slab.

1. Place "Clean Drainage Fill" in one lift and compact with a vibratory steel wheel roller to at least 95 percent of the Standard Proctor maximum dry density at a moisture content sufficient to achieve this level of compaction.
2. Place and compact 1 or 2 inches of sand or limestone screenings within the upper portion of the "Clean Drainage Fill" according to the recommendations of the Geotechnical Engineering Report.

### 3.18 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of the optimum moisture content.
  1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
  2. Remove and replace, or scarify and air-dry, otherwise "Satisfactory Soil" material that exceeds optimum moisture content and are too wet to compact to specified density.

### 3.19 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 9 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of Standard Proctor maximum dry density according to ASTM D 698:
  1. Under structures, building slabs, steps, stairs, walks, ramps, and pavements, scarify and recompact top 9 inches of existing subgrade and each layer of backfill or fill material to not less than 95 percent of Standard Proctor maximum dry density.
  2. Under lawn or unpaved areas, scarify and recompact top 9 inches below subgrade and compact each layer of backfill or fill material to not less than 90 percent of Standard Proctor maximum dry density.

### 3.20 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  1. Provide a smooth transition between adjacent existing grades and new grades.
  2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1.2 inches.
  2. Walks: Plus or minus 1.2 inches.
  3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot straightedge.

### 3.21 GRANULAR BASE COURSE

- A. Under concrete pavements “Granular Base Course” on prepared subgrade and as follows:
1. Compact base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of Standard Proctor maximum dry density according to ASTM D 698.
  2. Shape base course to required crown elevations and cross-slope grades.
  3. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
  4. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

### 3.22 SUBSURFACE DRAINAGE BACKFILL

- A. Refer to Specification Section 334100 - Storm Drainage Utility Piping for placement requirements.

### 3.23 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Owner’s Testing and Inspection Service.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.
1. Field in-place density tests may also be performed by the nuclear method according to ASTM D 6938, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556.
  2. When field in-place density tests are performed using nuclear methods, make calibration check of both density and moisture gauges at the beginning of work, on each different type of material encountered, and at intervals directed by the Architect.

3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
  4. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
  5. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

### 3.24 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Owner's Testing and Inspection Service; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

### 3.25 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 2000

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## SECTION 321216 - ASPHALT PAVING

### 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 REFERENCE SPECIFICATIONS

- A. Standard Specifications of the Kansas City Metro Chapter of the American Public Works Association, latest edition, form a part of this Section to the extent referred to.
- B. Standard Specifications of the City of Kansas City Missouri (KCMO).

#### 1.3 SUMMARY

- A. This Section includes provisions for hot-mix asphalt paving over prepared subgrade.
- B. Related Sections include the following:
  - 1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and aggregate pavement shoulders.
  - 2. Division 31 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

#### 1.4 SUBMITTALS

- A. General: Submit according to the following:
  - 1. Each sheet or page of each submittal shall bear the review stamp of the Contractor indicating the submittal has been reviewed and is approved. Submittals not bearing the Contractor's review stamp will be returned without review.
  - 2. Contract drawings may not be reproduced in whole or in part to be utilized as a submittal. Contract drawings reproduced in whole or in part and modified into submittals will not be accepted and will be returned without review.
  - 3. Submittals shall be complete and clearly indicate compliance with specified requirements. Submission of a typical nature for separate components or items but not indicating the specifics of each will not be accepted and will be returned without review.
- B. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

- D. Asphalt-aggregate mixture design for each type of asphalt-aggregate mixture.

## 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
  - 1. Prime Coat: Minimum surface temperature of 60 deg F.
  - 2. Tack Coat: Minimum surface temperature of 40 deg. F.
  - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
  - 4. Asphalt Surface Course: Minimum surface temperature of 50 deg F (15.5 deg C) at time of placement.
- B. Grade Control: Establish and maintain required lines and elevations.

## PART 2 - PRODUCTS

### 2.1 MIXES

- A. Base Course: APWA Type 5-01
- B. Surface Course: APWA Type 3-01

### 2.2 AGGREGATES

- A. Coarse Aggregate: Sound; angular crushed stone; crushed gravel.
- B. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; or gravel, complying with ASTM D 1073.
  - 1. Reduce percentage of natural sand to 10 percent if slow, heavily loaded traffic is anticipated.
  - 2. For hot mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- C. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

### 2.3 ASPHALT MATERIALS

- A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.
- B. Prime Coat: ASTM D 2027; medium-curing cutback asphalt; MC-30, MC-70, or MC-250.
- C. Tack Coat: ASTM D 977, Grade SS-1H.



- D. Water: Potable.

## 2.4 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.
- B. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N.
  - 1. Color: As indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subgrade, using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

### 3.2 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course, if any. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- C. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.20 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.
  - 3. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

### 3.3 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses required.
  - 2. Place hot-mix asphalt surface course in single lift.
  - 3. Spread mix at minimum temperature of 250 deg F.
  - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
  - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide, except where infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.4 JOINTS

- A. Construct joints between old and new pavements, or between successive day's work. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat.
  - 2. Offset longitudinal joints in successive courses a minimum of 6 inches.
  - 3. Offset transverse joints in successive courses a minimum of 24 inches.
  - 4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
  - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
  - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.5 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown,

grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and re-rolling to required elevations.

- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  - 1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm. Continue rolling until roller marks are eliminated and course has obtained required density.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.6 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus 1/2 inch (13 mm), no minus.
  - 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: 1/4 inch.
  - 2. Surface Course: 1/8 inch.
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

### 3.7 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

- B. Use chlorinated-rubber base traffic lane-marking paint, factory-mixed, quick-drying, and non-bleeding.
- C. Allow paving to cure for 30 days before starting pavement marking.
- D. Sweep and clean surface to eliminate loose material and dust.
- E. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

### 3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements. Repair or remove and replace unacceptable paving as directed by Architect.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. Check surface areas at intervals as directed by Architect.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 32 1216

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## SECTION 321313 – CONCRETE PAVING

## PART 1 - GENERAL

## 1.1 SUMMARY

A. This Section includes exterior concrete paving for the following:

1. Drive aisles.
2. Curbs.
3. Curbs and gutters.
4. Sidewalks.
5. Ramps.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete".
2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and base course.
3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

## 1.2 SUBMITTALS

A. General: Submit according to the following:

1. Each sheet or page of each submittal shall bear the review stamp of the Contractor indicating the submittal has been reviewed and is approved. Submittals not bearing the Contractor's review stamp will be returned without review.
2. Contract drawings may not be reproduced in whole or in part to be utilized as a submittal. Contract drawings reproduced in whole or in part and modified into submittals will not be accepted and will be returned without review.
3. Submittals shall be complete and clearly indicate compliance with specified requirements. Submission of a typical nature for separate components or items but not indicating the specifics of each will not be accepted and will be returned without review.

B. Concrete mix designs for each class of concrete. Submittal shall establish weights and volumes of all materials used for each class of concrete in accordance with ACI 318, and shall include the following:

1. Concrete mix proportions.
2. Documentation of test records and standard deviations for field experience method or,
3. Laboratory test results for trial batch method.
4. Materials certificates for cements, fly ash, and aggregates. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds the specified requirements.
5. Product data sheets for admixtures. Provide certifications from admixture manufacturers that chloride content complies with specified requirements.

- C. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, and curing compounds.

### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
  - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- E. Concrete Standards: Comply with provisions of the following Standard's, except where more stringent requirements are indicated.
  - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
  - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
  - 3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

### 1.4 COORDINATION

- A. Coordinate with equipment and integral anchors, and other items embedded in concrete.

### 1.5 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

## PART 2 - PRODUCTS

### 2.1 CONCRETE MATERIALS

- A. General: Materials for use in concrete shall conform to the requirements of the MCIB. Use the same brand and type of cementitious material from the same manufacturer throughout the Project unless otherwise acceptable to the Engineer.

## 2.2 CONCRETE MIXES

- A. Concrete mix designs shall have a minimum compressive strength of 5,000 psi and be a pre-approved MCIB mix design.
- B. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- C. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
- D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to MCIB specifications.
- E. Aggregates: Aggregates must be proportioned to have a minimum of 50% coarse aggregate by weight.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content by volume of 6.5% within a tolerance of plus or minus 1.5 percent:

## 2.3 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
  - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## 2.1 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain no chloride ions.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

## 2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
  - 1. Use flexible or curved forms for curves of a radius 100 feet or less.



- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

## 2.3 STEEL REINFORCEMENT

- A. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain Steel Wire: ASTM A 82, as drawn.
- C. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- D. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

## 2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

## 2.5 RELATED MATERIALS

- A. Expansion- and Expansion-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non-re-dispersible, acrylic emulsion or styrene butadiene.

## PART 3 - EXECUTION

### 3.1 SURFACE PREPARATION

- A. Check for unstable areas and verify need for additional compaction. Proceed with concrete placement only after nonconforming conditions have been corrected.

- B. Remove loose material from surface immediately before placing concrete.

### 3.2 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. Check completed formwork and screeds for grade and alignment to following tolerances:
  - 1. Top of Forms: Not more than 1/16 inch in 10 feet.
  - 2. Vertical Face of Longitudinal Axis: Not more than 1/8 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

### 3.3 PLACING STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

### 3.4 JOINTS

- A. General: Construct construction, expansion, and contraction (control) joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
  - 1. When joining existing concrete, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of concrete and at locations where concrete operations are stopped for more than one-half hour, unless concrete terminates at expansion joints.
  - 1. Continue reinforcement across construction joints, unless otherwise indicated.
  - 2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Expansion Joints: Form expansion joints of preformed joint-filler strips where indicated.
  - 1. In curb and curb and gutter, locate expansion joints at points of curvature.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length or provide and install expansion cap or tube to prevent concrete bonding to one side of joint.
- E. Contraction (Control) Joints: Form weakened-plane contraction (control) joints, sectioning concrete into areas as indicated. In curb and gutter, form contraction joints equidistant between expansion joints at intervals not exceeding 10 feet. Construct contraction (control) joints for a depth indicated, as follows:
1. Sawed Joints (Concrete Pavements): Form contraction (control) joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
  2. Tooled Joints (Concrete Walks): Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes

### 3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from base surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- D. Do not add water to concrete during delivery, at Project site, or during placement.
- E. Deposit and spread concrete in a continuous operation between joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

- G. Screed surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- H. Do not operate equipment on concrete until concrete has attained 85 percent of its 28-day compressive strength.
- I. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- J. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms, reinforcement steel, and base just before placing concrete. Keep base course moisture uniform without standing water, soft spots, or dry areas.

### 3.6 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven 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. Re-float surface immediately to uniform granular texture.
  - 1. Medium -Textured Broom Finish: Draw a broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, medium texture at all locations unless otherwise specified.

### 3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. 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 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.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### 3.8 TOLERANCES

- A. Comply with tolerances of 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, unlevelled straightedge not to exceed 1/8 inch
  - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch
  - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch
  - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Edge: 1/2 inch
  - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Edge: Length of dowel 1/4 inch per 12 inches
  - 8. Joint Spacing: 3 inches
  - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 10. Joint Width: Plus 1/8 inch, no minus.

### 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Allow testing agency to inspect and test subgrade preparation and base course installation. Proceed with subsequent work only after test results for previously completed work comply with requirements.
- C. 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 25 cu. yd., plus one set for each additional 50 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. 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.
  8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
  9. 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 . When 7-day test is less than 70 percent of 28-day requirement, concrete may not gain adequate strength. Notify Architect in writing and acknowledge potential non-complying concrete.
- D. Test results shall be reported in writing to Architect, concrete manufacturer (as applicable), 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, 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.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.

- F. 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 Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

### 3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory areas with portland cement concrete bonded with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from concrete for at least 14 days after placement. When construction traffic is permitted, maintain concrete as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete free of stains, discoloration, dirt, and other foreign material. Sweep concrete not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 1313