La Plata West Water Authority

RAW WATER PROJECT

CONTRACT 1: Raw Water Pumping Facilities and Pipeline CONTRACT 2: Underwater Installation of Intake Screen(s) CONTRACT 3: Lake Durango Treated Water Pipeline

ADDENDUM NO. 3

December 10, 2015

TO ALL BIDDERS:

Contractors submitting proposals for the above referenced project shall take note of the following changes, additions, deletions, clarifications, etc. to the Plans and Specifications which shall become a part of and have precedence over anything shown or described in the Contract Documents and shall be taken into consideration and be included with Contract Documents for the referenced project.

NOTE: Bidders must acknowledge receipt of Addenda on the first page of Document C-410 BID FORM and sign below and attach this sheet to the bid submittal.

Company

Signature

BARTLETT & WEST, INC.

Jeff Shamburg, P.E.

# **GENERAL CLARIFICATIONS**

- A. The BID DATE is being postponed until January 28, 2016, same time and place. Bid delay is due to continued easement acquisition issues unforeseen by Owner at time of bid advertisement. Due to delay and Engineer's holiday staffing, questions prior to January 7 may remain unanswered until that date.
- B. The roof access later shall be made of either Aluminum or galvanized steel per Specification 055000 and Drawing A101.
- C. References to "DI" in the "Reference Notes" of drawings D101 and D105 can be disregarded. Refer to Division 40-PROCESS INTEGRATION for specification on acceptable valve material.
- D. Disregard the turnaround area outline on the East side of the Booster Pump Station on sheet C108. Gravel surface in the area of the booster station is only a continuation of the roadway as shown.
- E. Contractor may propose installation of pipe using directional boring rather than trenching on a case by case basis, but without an adjustment to bid price of trenched installation.
- F. Contractor may propose installation of HDPE pipe in substitution of PVC, but only if inside diameter and pressure rating equal to that of PVC as specified is maintained. This may require increasing to next nominal diameter and will not result in an adjustment to bid price of PVC installation.
- G. Although not identified in the drawings, lightning protection meeting specifications is required for both buildings.

# **DRAWINGS**

- A. DELETE all references to "TYPE E" soil in detail 8 of sheet C158 and refer to Section 312310 in the specifications for backfill materials.
- B. C150
  - 1. DELETE General Note 1 and replace it with the following: "See Detail 6 on sheet C156 for access road aggregate thickness."
- C. Sheet E410:
  - 1. Intake building distribution panel "MDP" as scheduled shall have and minimum AIC rating of 32,000 Amperes.

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- 2. Booster building distribution panel "MDP" as scheduled shall have and minimum AIC rating of 24,000 Amperes.
- 3. Booster building distribution panel "PP1" as scheduled shall have and minimum AIC rating of 12,000 Amperes.
- D. REPLACE sheets C137, C143, C149, C151, and C156 with the attached sheets.

# **TECHNICAL SPECIFICATIONS**

- A. C-111
  - 1. DELETE this section in its entirety and REPLACE it with Document C-111 with a date of 12/10/15 in the footer, attached to this addendum.
- B. Document C-410 (Contract 1)
  - 1. DELETE this section in its entirety and REPLACE it with Document C-410 with a revised date of 12/10/15 in the footer, attached to this addendum.
- C. Document C-410 (Contract 3)
  - 1. DELETE this section in its entirety and REPLACE it with Document C-410 with a revised date of 12/10/15 in the footer, attached to this addendum.
- D. Section 012000
  - 1. DELETE this section in its entirety and REPLACE it with Section 012000 with a revised date of 12/10/15 in the footer, attached to this addendum.
- E. Section 014126
  - 1. DELETE Part 1.01.D.1 in its entirety.
- F. Section 015510
  - 1. DELETE the last sentence stating "Access to the school district easement shall only have one access in and out." in Part 1.04.A.
- G. Section 034100
  - 1. DELETE Part 2.09.A and INSERT the following: "Exterior Panels shall be insulated with an R-value of 4 per inch and thickness of 2-inches."
- H. Section 077200
  - 1. DELETE Part 2.03.F.2 referencing remote-control operation.

- I. Section 099100
  - 1. DELETE this section in its entirety and REPLACE it with Section 099100 with a revised date of 12/10/15 in the footer, attached to this addendum.
- J. Section 262416
  - 1. DELETE this section in its entirety and REPLACE it with Section 262416 with a revised date of 12/10/15 in the footer, attached to this addendum.
- K. Section 262816
  - 1. DELETE sections 2.01.E.3, 2.01.E.5, 2.01.E.6, and 2.01.E.9 entirely.
  - 2. DELETE sections 2.02.E.2 through 2.02.E.7 entirely.
- L. Section 262923
  - DELETE this section in its entirety and REPLACE with the attached Revised Electrical specification for Section 262923 "VARIABLE-FREQUENCY MOTOR CONTROLLERS".
- M. Section 264113
  - 1. ADD the following to the list of suppliers in Part 2.01.B.1: Thompson Lightning protection, Inc.
- N. Section 330522
  - 1. DELETE Part 1.02.F in its entirety.
- O. Section 331219
  - 1. DELETE this section in its entirety and REPLACE it with Section 331219 with a revised date of 12/10/15 in the footer, attached to this addendum.
- P. Section 352104
  - 1. DELETE Part 2.A.1 and insert the following as Part 2.A.1:

"All system components and equipment utilized in the intake screen system, including the system described in Section 1.01 shall be furnished as a complete integrated system by one manufacturer; Johnson Screen, New Brighton, MN, model T-42HCE; Hendrick Screen Company, Owensboro, KY; or equal."

Q. Section 400513

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- 1. ADD the following to the list of suppliers in Part 2.11-B and 2.11-A: A.Y. McDonald MFG. CO.
- R. Section 400514
  - 1. DELETE Part 2.01.C in its entirety.
  - 2. DELETE the word "American" in the last sentence in Part 2.02-B.
  - 3. DELETE the last sentence of Part 2.03.A and replace with the following:
    - i. Below grade, pressurized ductile iron pipe and fittings shall have thrust restrained joints as prescribed in "Thrust Restraint Design for Ductile Iron Pipe", 7<sup>th</sup> Edition, published by DIPRA.
  - 4. DELETE "Buna-N" at the end of the sentence and INSERT "synthetic or natural rubber in accordance with AWWA C111" in its place in Part 2.04.A and Part 2.04.B.
  - 5. DELETE the first sentence of Part 2.07A and replace with the following:

Thrust restrained joints for ductile iron pipe and fittings shall be Flex-Ring, as manufactured by the American Cast Iron Pipe Co. or TR-Flex as manufactured by US Pipe, mechanical joint with retainer glands or MJ close coupled for buried installation, and flanged for exposed or above ground installation.

- S. Section 400517
  - 1. DELETE "ten gauge (10 AWG)" in the middle of Part 2.07.B and INSERT "12 gauge (12 AWG)".
- T. Section 400560
  - 1. DELETE this section in its entirety and REPLACE it with Section 400560 with a revised date of 12/10/15 in the footer, attached to this addendum.
- U. Section 409000
  - 1. DELETE Part 1.02.A.1 and insert the following as Part 1.02.A.1:

"Browns Hill and Controls, Durango, CO; Pillar Innovations, Farmington, NM; Bauman Instrument Corporation, Tulsa, OK.

Pre-approval indicates initial acceptability for this project, but does not relieve any contractor from compliance with all specifications and contract documents."

V. Section 412200

 $\label{eq:linear} $$ 1000 fs 01\ 0.00 \ 0.$ 

- 1. DELETE "Multiple" and INSERT "Single" in Part 2.04.
- 2. DELETE the second sentence in Part 2.07.C.
- 3. ADD Part 2.08.F as follows:

"Alternately, a c-track festoon system may be utilized, with a second c-track for a traveling pendant festoon."

- W. Section 432115
  - 1. ADD the following to the list of "Pump manufacturers and models:" in table under Part 3.04.C: DP Pumps.
- X. Section 432150
  - 1. ADD the following to the list of "Pump manufacturers and models:" in table under Part 3.07.B: Layne Verti-line, Peerless.

# La Plata West Water Authority Lake Durango Water Authority La Plata County, Colorado Raw Water Project

## **ADVERTISEMENT FOR BIDS**

Sealed Bids for the construction of the Raw Water Project will be received, by La Plata West Water Authority and Lake Durango Water Authority, at the office of Bartlett & West, Inc., 1199 Main Ave., Suite 209, Durango, Colorado 81301, until 2:00 PM local time on January 28, 2016, at which time the Bids received will be publicly opened and read. The Project consists of constructing an Intake Pumping Station, Booster Pump Station, Water Intake Screen(s), raw water pipeline and appurtenances, treated water pipeline and appurtenances, and other associated Work.

Bids will be received for a three Contracts:

Contract 1: Raw Water Pumping Facilities and Pipeline

Contract 2: Underwater Installation of Cylindrical Water Intake Screen(s)

Contract 3: Lake Durango Treated Water Pipeline

Bids shall be on a lump sum and unit price basis, with alternate bid items as indicated in the Bid Form.

The Issuing Office for the Bidding Documents is:

Bartlett & West, Inc. 1199 Main Ave., Suite 209 Durango, CO 81301 (970) 306-0924 Jeffrey Shamburg, PE jeff.shamburg@bartwest.com

Prospective Bidders may examine the Bidding Documents at the Issuing Office on Mondays through Fridays between the hours of 9:00 AM - 4:00 PM, and may obtain copies of the Bidding Documents from the Issuing Office as described below.

Bidding Documents may be viewed and ordered online by registering with the Issuing Office at their website (http://www.bartwest.com, follow "Bid Documents" link). Following registration and payment of \$40 download fee, complete sets of Bidding Documents may be downloaded from the Issuing Office's website as "zipped" portable document format (PDF) files. The cost of printed Bidding Documents, including shipping from the Issuing Office is \$400 for Contract 1 and Contract 3 documents and \$40 for Contract 2 documents. Cost of Bidding Documents and shipping is non-refundable. The date that the Bidding Documents are transmitted by the Issuing Office will be considered the Bidder's date of receipt of the Bidding Documents. Partial sets of the Bidding Documents will not be available from the Issuing Office.

A pre-bid conference will be held at 10:00 AM local time on November 10, 2015 at La Plata Electric Association, 45 Stewart St., Durango, Colorado. Attendance at the pre-bid conference is highly encouraged but is not mandatory.

Bid security shall be furnished in accordance with the Instructions to Bidders.

Owner: La Plata West Water Authority (Contracts 1 & 2), Lake Durango Water Authority (Contract 3)

- By: Roy Horvath
- Title: President, LPWWA
- Date: October 30, 2015 November 25, 2015 December 10, 2015

+ + END OF ADVERTISEMENT FOR BIDS + +

# BID FORM FOR CONSTRUCTION CONTRACTS

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# **BID FORM**

Contract 1: Raw Water Pumping Facilities and Pipeline Raw Water Project La Plata West Water Authority

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## **ARTICLE 1 – BID RECIPIENT**

1.01 This Bid is submitted to:

Bartlett & West, Inc. c/o La Plata West Water Authority 1199 Main Ave, Suite 209

# Durango, CO 81301

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

### **ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS**

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

### **ARTICLE 3 – BIDDER'S REPRESENTATIONS**

- 3.01 In submitting this Bid, Bidder represents that:
  - A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

<u>Addendum No.</u>	Addendum, Date

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.
- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

# **ARTICLE 4 – BIDDER'S CERTIFICATION**

- 4.01 Bidder certifies that:
  - A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
  - B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
  - C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
  - D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
    - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
    - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
    - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

### ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

# **Bid Package 1: Intake Pump Station**

Base Bid Item 1: Intake Pump Station	\$
Bid Item 2: Sitework and Yard Piping	\$
Bid Item 3: Instrumentation and Control	\$
Alternate 1 Add: Air Burst System	\$
Alternate 2 Add: Bridge Crane	\$

# **Total of All Lump Sums**

### **Bid Package 2: Booster Pump Station**

Base Bid Item 1: Booster Pump Station	\$
Bid Item 2: Sitework and Yard Piping	\$
Bid Item 3: Instrumentation and Control	\$
Alternate 1 Deduct: Alternate Pump Configuration 1	\$
Alternate 2 Deduct: Alternate Pump Configuration 2	\$
Alternate 3 Add: Extended Performance Test	\$

# **Total of All Lump Sums**

\$

\$

ltem No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1	Unclassified Excavation	CY	11,800		
2	Rock Excavation	CY	2,000		
3	Roadway Sub-Base	CY	1,800		
4	Roadway Base	CY	870		
5	18" Storm Sewer Culvert Pipe	LF	201		
6	24" Storm Sewer Culvert Pipe	LF	29		
7	30" Ductile Iron Pipe	LF	4,000		
8	30" 11 1/4° Bend	EA	3		
9	30" 22 1/2° Bend	EA	8		
10	30" 45° Bend	EA	6		
11	Air/Vacuum Valve	EA	1		
12	Pig Retrieval Manhole	EA	1		
13	Electric Trenching and Backfill	LF	4,150		
Total of	Total of All Unit Price Bid Items			\$	
A1	Alternate Add Minimum Bury Depth – 60"	LF	4,000		

# UNIT PRICE BID

### Bid Package 4: 125 Pipeline

ltem No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1	8" CL 235 AWWA C-900 PVC Pipe	LF	8,975		
2	8" CL 165 AWWA C-900 PVC Pipe	LF	3,045		
3	8" CL 235 AWWA C-900 RJ PVC Pipe	LF	300		
4	Rock Excavation	CY	356		
5	NOT USED				
6	8" 11 1/4° Bend and Block	EA	4		
7	8" 11 1/4° Vertical Bend and Block	EA	6		
8	8" 22 1/2° Bend and Block	EA	5		
9	8" 22 1/2° Vertical Bend and Block	EA	1		
10	8" 45° Bend and Block	EA	2		
11	8" 90° Bend and Block	EA	2		
12	8" 90° Vertical Bend and Block	EA	1		
13	8" Gate Valve, Buried	EA	1		
14	8" Type 2 Road Crossing	EA	2		
15	8" Low Point Drain	EA	11		
16	Air/Vacuum Valve	EA	4		
17	Remove and Replace Gravel Surface	SY	270		
18	Remove and Replace Asphaltic Concrete Pavement	SY	73		
19	High Pressure Gas Main Crossing	LS	1		
Total of All Unit Price Bid Items					\$

# UNIT PRICE BID

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
A1.1	10" CL 235 AWWA C-900 PVC Pipe	LF	3,100		
A1.2	10" CL 165 AWWA C-900 PVC Pipe	LF	8,920		
A1.3	10" CL 235 AWWA C-900 RJ PVC Pipe	LF	300		
A1.4	Rock Excavation	CY	378		
A1.5	NOT USED				
A1.6	10" 11 1/4° Bend and Block	EA	4		
A1.7	10" 11 1/4° Bend and Block	EA	6		
A1.8	10" 22 1/2° Bend and Block	EA	5		
A1.9	10" 22 1/2° Vertical Bend and Block	EA	1		
A1.10	10" 45° Bend and Block	EA	2		
A1.11	10" 90° Bend and Block	EA	2		
A1.12	10" 90° Vertical Bend and Block	EA	1		
A1.13	10" Buried Gate Valve	EA	1		
A1.14	10" Type 2 Road Crossing	EA	2		
A1.15	10" Low Point Drain	EA	11		
A1.16	Air/Vacuum Valve	EA	4		
A1.17	Remove and Replace Gravel Surface	SY	270		
A1.18	Remove and Replace Asphaltic Concrete Pavement	SY	73		
A1.19	High Pressure Gas Main Crossing	LS	1		
Total of	All Alternate 1 Unit Price Bid Items				\$

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
A2.1	16" CL 235 AWWA C-900 PVC Pipe	LF	12,020		
A2.2	16" CL 235 AWWA C-900 RJ PVC Pipe	LF	300		
A2.3	Rock Excavation	CY	444		
A2.4	NOT USED				
A2.5	16" 11 1/4° Bend and Block	EA	4		
A2.6	16" 11 1/4° Bend and Block	EA	6		
A2.7	16" 22 1/2° Bend and Block	EA	5		
A2.8	16" 22 1/2° Vertical Bend and Block	EA	1		
A2.9	16" 45° Bend and Block	EA	2		
A2.10	16" 90° Bend and Block	EA	2		
A2.11	16" 90° Vertical Bend and Block	EA	1		
A2.12	16" Buried Gate Valve	EA	1		
A2.13	16" Type 2 Road Crossing	EA	2		
A2.14	16" Low Point Drain	EA	11		
A2.15	Air/Vacuum Valve	EA	4		
A2.16	Remove and Replace Gravel Surface	SY	270		
A2.17	Remove and Replace Asphaltic Concrete Pavement	SY	73		
A2.18	16" Tee and Cap Assembly	EA	1		
A2.19	High Pressure Gas Main Crossing	LS	1		
Total of	All Alternate 2 Unit Price Bid Items				\$

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ltem No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
A2.21	Alternate Add Minimum Bury Depth – 60"	LF	12,320		

### Bid Package 5: Lake Durango Pipeline

ltem No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1	8" CL 165 AWWA C-900 PVC Pipe	LF	7,220		
2	Rock Excavation	CY	215		
3	8" 11 1/4° Bend and Block	EA	8		
4	8" 22 1/2° Bend and Block	EA	11		
5	8" 45° Bend and Block	EA	4		
6	8" 90° Bend and Block	EA	2		
7	8" Gate Valve, Buried	EA	3		
8	8" Type 3 Road Crossing	EA	1		
10	8" Low Point Drain	EA	4		
11	Fire Hydrant Assembly	EA	1		
12	Air/Vacuum Valve	EA	5		
13	Remove and Replace Gravel Surface	SY	61		
14	Outlet Structure	LS	1		
Total of	Total of All Unit Price Bid Items				\$
A1	Alternate Add Minimum Bury Depth – 60"	LF	7,220		

### **UNIT PRICE BID**

Time of Completion

- 5.02 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 5.03 Bidder accepts the provisions of the Agreement as to liquidated damages.

# **ARTICLE 6 – ATTACHMENTS TO THIS BID**

- 6.01 The following documents are submitted with and made a condition of this Bid:
  - A. Required Bid security;
  - B. List of Proposed Subcontractors;
  - C. List of Proposed Suppliers;
  - D. List of Project References;
  - E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;
  - F. Contractor's License No.: \_\_\_\_\_ (if applicable); and
  - G. Required Bidder Qualification Statement with supporting data

# **ARTICLE 7 – DEFINED TERMS**

7.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

# **ARTICLE 8 – BID SUBMITTAL**

BIDDER: Indicate correct name of bidding entity

By: Signature	
Printed name (If Bidder is a corporation, evidence of authority to si	a limited liability company, a partnership, or a joint venture, attach gn.)
Attest: Signature	
Printed name	
Title:	
Submittal Date:	
Address for giving notices:	
Telephone Number:	
Fax Number:	
Contact Name and e-mail	address:
Bidder's License No.:	(where applicable)

# BID FORM FOR CONSTRUCTION CONTRACTS

Prepared by



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# **BID FORM**

Contract 3: Lake Durango Treated Water Pipeline Lake Durango Water Authority

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## **ARTICLE 1 – BID RECIPIENT**

1.01 This Bid is submitted to:

Bartlett & West, Inc. c/o Lake Durango Water Authority 1199 Main Ave, Suite 209

### Durango, CO 81301

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

### **ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS**

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

### **ARTICLE 3 – BIDDER'S REPRESENTATIONS**

- 3.01 In submitting this Bid, Bidder represents that:
  - A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

<u>Addendum No.</u>	Addendum, Date			

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.
- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

# **ARTICLE 4 – BIDDER'S CERTIFICATION**

- 4.01 Bidder certifies that:
  - A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
  - B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
  - C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
  - D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
    - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
    - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
    - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

# ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1	Mobilization		LUMP SUM		
2	4" AWWA C-900 PVC Pipe	LF	5,397		
3	Rock Excavation	СҮ	10		
4	4" 11 1/4° Bend	EA	5		
5	4" 22 1/2° Bend	EA	6		
6	4" Buried Gate Valve	EA	1		
7	4" Connect to Existing	EA	1		
8	Air/Vacuum Valve	EA	1		
9	New Meter Installation	EA	10		
10	2 1⁄2" Flush Hydrant	EA	1		
Total of All Unit Price Bid Items			\$		
A1	Deduct for Concurrent Award of Contract 1		LUMP SUM		

## UNIT PRICE BID

Time of Completion

- 5.02 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 5.03 Bidder accepts the provisions of the Agreement as to liquidated damages.

# **ARTICLE 6 – ATTACHMENTS TO THIS BID**

- 6.01 The following documents are submitted with and made a condition of this Bid:
  - A. Required Bid security;
  - B. List of Proposed Subcontractors;
  - C. List of Proposed Suppliers;
  - D. List of Project References;
  - E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;
  - F. Contractor's License No.: \_\_\_\_\_ (if applicable); and
  - G. Required Bidder Qualification Statement with supporting data

# **ARTICLE 7 – DEFINED TERMS**

7.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

# **ARTICLE 8 – BID SUBMITTAL**

BIDDER: Indicate correct name of bidding entity

By: Signature	
Printed name (If Bidder is a corporation, evidence of authority to sig	a limited liability company, a partnership, or a joint venture, attach gn.)
Attest: Signature	
Printed name	
Title:	
Submittal Date:	
Address for giving notices:	
Telephone Number:	
Fax Number:	
Contact Name and e-mail a	address:
Bidder's License No.:	(where applicable)

### **SECTION 012000**

### MEASUREMENT AND PAYMENT

#### PART 1 GENERAL

### 1.01 METHODS OF MEASUREMENTS AND BASIS FOR PAYMENTS.

- A. All work to be performed under this contract shall be paid for at the lump sum or unit prices stated in the Bid Form. Unit price payments will be based upon the measurement of actual quantities furnished and installed in accordance with the Contract Documents and accepted by the Engineer. Lump sum payments will be based upon completed and accepted items in accordance with its description in this section and as related to the work specified and as shown on the Drawings.
- Β. Payment for the items set forth herein, as further specified herein, shall include full compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, mobilization and demobilization, utilities, coordination, taxes, materials, commissions, transportation and handling, traffic control, barricades, signs, lights, and other traffic control devices, bonds, permit fees, insurance, overhead and profit, incidentals appurtenant to the items of work being described and performing all operations as necessary to complete the various items of the work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). Such compensation shall also include payment for any loss or damages arising directly or indirectly from the work, or from any discrepancies between the actual quantities of work and those shown in the Contract Documents, or from any unforeseen difficulties, which may be encountered during the prosecution of the work until the final acceptance by the Owner. Any material, equipment or operation not specifically mentioned shall be considered to be incidental to the lump sum or unit prices. Final payment will only be made for completed and accepted work.
- C. The Contractor's attention is called to the fact that the contract prices set forth in the bid form establish the total price for completing the work in its entirety. Should the Contractor feel that the cost of any item of work has not been established by the Schedule of Payment Items or this Section he shall include the cost for that work in some other bid item, so that his proposal for the project does reflect his total price for completing the work in its entirety.

### 1.02 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of product to Contractor or Subcontractor, less applicable trade discounts.
- B. Costs Not Included in Cash Allowances but Included in Contract Sum/Price: Product, delivery to site and handling at site, including unloading, uncrating, and storage, protection of products from elements and from damage, and labor for installation and finishing and appurtenances and accessories required to properly install the products.

### 1.03 MEASUREMENT

A. The quantities for unit price payment under this Contract shall be determined by actual measurement of the completed items, in place, ready for service and accepted by the Engineer. Lump sum item payment under this Contract shall be in accordance with the Schedule of Payment Items as described in the Submittals Section, unless otherwise specified. A representative of the Contractor shall witness all field measurements.

## 1.04 PAYMENT ITEMS – CONTRACT 1, BID PACKAGE 1 (INTAKE PUMP STATION):

- A. Intake Pump Station Bid Item No. 1:
  - 1. Measurement will be made by the lump sum price for the installation of the raw water pump station at the intake structure, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the raw water pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the Pump Station including but not limited to mobilization, bonds, insurance, traffic control, erosion control, pumps, piping, valves, concrete, reinforcement, variable frequency drives, pressure gauges, building, mechanical, electrical and structural work, bridge crane foundation and column pads, earthwork, appurtenances, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- B. Sitework and Yard Piping Bid Item No. 2:
  - 1. Measurement will be made by the lump sum price for the installation of all exterior site work and yard piping at the intake pump station, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the exterior site work and yard piping at the intake pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the Pump Station including but not limited to piping up to and including the meter vault, electrical and structural work, fittings, valves and appurtenances, earthwork, gravel surfacing, the meter vault, including excavation and backfill, flow meter, concrete manhole, manhole cover, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- C. Instrumentation and Control Bid Item No. 3:
  - 1. Measurement will be made by the lump sum price for the installation of the instrumentation and control system at the intake structure, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the instrumentation and control system at the intake pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the portions of the system as described in Section 409000 that are installed at the Intake Pump Station site, including but not limited to, control panels, programmable logic devices, industrial computers and displays, data radios and antennas, level and pressure sensor systems, software programming and commissioning, software licenses, associated mechanical, electrical and structural work, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- D. Air Burst System Alternate Bid Item No. 1:
  - 1. Measurement will be made by the lump sum price for the installation of intake screen air burst system at the intake structure, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the instrumentation and control system at the raw water pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the portions of the system as described in Section 352104 that are installed at the Intake Pump Station site, including but not limited to compressor, air receiver/reservoir, control panels, programmable logic devices, software programming and commissioning, software licenses, interconnection with station instrumentation and control system, associated mechanical, electrical and structural work, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- E. Bridge Crane Alternate Bid Item No. 2:
  - 1. Measurement will be made by the lump sum price for the installation of the bridge crane at the intake structure, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the bridge crane at the raw water pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the portions of the system as described in Section 412212 that are installed at

the Intake Pump Station site, including but not limited to structural columns and baseplates, crane girder, trolley and hoist, associated mechanical, electrical and structural work, and all other items of work necessary to complete the work in accordance with the Contract Documents.

### 1.05 PAYMENT ITEMS – CONTRACT 1, BID PACKAGE 2 (BOOSTER PUMP STATION):

- A. Booster Pump Station Bid Item No. 1:
  - 1. Measurement will be made by the lump sum price for the installation of the booster pump station, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the booster pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the Pump Station including but not limited to mobilization, bonds, insurance, traffic control, erosion control, pumps, piping, valves, concrete, reinforcement, variable frequency drives, pressure gauges, building, mechanical, electrical and structural work, earthwork, appurtenances, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- B. Sitework and Yard Piping Bid Item No. 2:
  - 1. Measurement will be made by the lump sum price for the installation of all exterior site work and yard piping at the booster pump station, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the exterior sitework and yard piping at the booster pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the Pump Station including but not limited to piping, meter vault, electrical and structural work, fittings, valves and appurtenances, earthwork, gravel surfacing, the meter vault, including excavation and backfill, flow meter, concrete manhole, manhole cover, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- C. Instrumentation and Control Bid Item No. 3:
  - 1. Measurement will be made by the lump sum price for the installation of the instrumentation and control system at the booster pump station, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the instrumentation and control system at the booster pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the portions of the system as described in Section 409000 that are installed at the Booster Pump Station site, including but not limited to, control panels, programmable logic devices, industrial computers and displays, data radios and antennas, pressure sensor system, software programming and commissioning, software licenses, associated mechanical, electrical and structural work, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- D. Alternate Pump Configurations Alternate Bid Items No. 1 and No. 2:
  - 1. Measurement will be made by the lump sum price for the installation of alternate pumps and associated equipment at the booster pump station, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of alternate pumps and associated equipment at the booster pump station which price shall include the complete furnishing and installation of all materials, labor and equipment for the portions of the alternate system as described in Section 432115, including but not limited to pumps, alternate variable frequency drives, conduit, conductors, disconnects and circuit breakers, associated mechanical, electrical and structural work, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- E. Extended Performance Test Alternate Bid Item No. 3:
  - 1. Measurement will be made by the lump sum price for the extended performance test of the entire Contract 1 project, completed and accepted.

2. Payment will be made at the lump sum price bid for extension of seven (7) day pump performance test period as described in Contract Documents to 60 days, which price shall include the complete furnishing and installation of all materials, labor and equipment including but not limited to, portable generators, fuel, regular service and lubrication as required by generator manufacturer, other parts and maintenance as required by manufacturer's recommended service intervals for all installed equipment, all other items of work necessary to complete the work in accordance with the Contract Documents. Generators used for this item shall conform to Section 263213.

# 1.06 PAYMENT ITEMS – CONTRACT 1, BID PACKAGE 3 (210 PIPELINE AND ACCESS ROAD):

- A. Unclassified Excavation Bid Item No. 1:
  - 1. Measurement will be made to the cubic yard for material, excluding rock, excavated and removed.
  - 2. Payment will be made at the unit price bid per cubic yard of excavation or embankment material. This price shall be deemed full compensation for excavation, backfill, compaction, sheeting, shoring, earthwork, removal of surface boulders, excavation for ditches, and grading to contour and shape the ground surface as proposed. Import of foreign fill or offsite disposal of excess fill shall be included in the payment for this item.
- B. Rock Excavation Bid Item No. 2:
  - 1. Measurement will be made to the cubic yard for rock excavated and removed.
  - 2. Payment will be made at the unit price bid per cubic yard of rock removed. This item shall represent the additional work required to remove rock from the excavation as defined in Section 312317 and shall be paid in addition to Bid Item 1, Unclassified Excavation and Bid Item 8, 30" Ductile Iron Pipe.
- C. Roadway Sub-Base: Bid Item No. 3
  - 1. Measurement will be made at the price bid per cubic yard of gravel placed and compacted.
  - 2. This item includes the complete furnishing and installation of all materials and labor for the aggregate/gravel roadway sub-base including but not limited to aggregate, earthwork, subgrade preparation, placing, compaction, removal of existing surfacing and all other items of work necessary to complete the work in accordance with the Contract Documents.
- D. Roadway Base: Bid Item No. 4
  - 1. Measurement will be made at the price bid per cubic yard of gravel placed and compacted.
  - 2. This item includes the complete furnishing and installation of all materials and labor for the aggregate/gravel roadway base including but not limited to mobilization, bonds, insurance, traffic control, erosion control, aggregate, earthwork, subgrade preparation, placing, compaction, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- E. Storm Sewer Culvert Pipe Bid Items No. 5 and No. 5:
  - 1. Measurement will be made by the nearest linear foot of pipe furnished and installed at the locations shown on the Drawings.
  - 2. Payment will made at the unit price bid which price shall include, erosion control trenching, bedding, backfill, compaction, pipe, installation of pipe, pipe end sections (if required), riprap (if required), and all incidental items.
- F. 30" Ductile Iron Pipe, In Place Bid Item No. 7:
  - 1. Measurement shall be made to the nearest linear foot of pipe installed. The length of pipeline to be paid for shall be based upon measurement of the completed and accepted pipelines along the horizontal projections of the centerline of the pipe, less the fitting laying length.
  - 2. Payment shall be made at the contract unit price bid per linear foot of pipe in place, completed and accepted. This price shall be deemed full compensation for mobilization, bonds, insurance, traffic control, erosion control, furnishing and installing all pipe, trenching, backfilling, compaction,

sheeting, shoring, earthwork, grading, joint materials, closure pieces, connection to adjoining pipe, cutting, polyethylene wrap (if required), tracer wire system (if required), bedding, jointing, testing, surface restoration and seeding, and any other incidental items required to complete the pipe installation as detailed and specified.

- G. Fittings Bid Items No. 8-10 Inclusive:
  - 1. Measurement will be made by each fitting of each type and size, completed and accepted.
  - 2. Payment will be made at the unit price bid for each type and size of fitting in place, which price shall include all labor, excavation, backfilling, compaction, sheeting, dewatering, concrete blocking (where required), anchoring, setting, bedding, joint materials, polyethylene wrap (if required), tracer wire system (if required), jointing, strapping, testing and incidental items required to complete the installation.
- H. Air /Vacuum Valve Bid Item No. 11:
  - 1. Measurement will be made for each air/vacuum valve and valve vault setting furnished and installed at the locations shown on the Drawings, completed and accepted.
  - 2. Payment will be made at the unit price bid for each air release/vacuum valve and vault setting which price shall include excavation, backfill, compaction, precast structure, access hatch or manhole ring and cover, pipe saddle, air release/vacuum valve and appurtenances, valve, piping and any other incidental and appurtenant items required to complete the installation as detailed and specified.
- I. Pig Retrieval Manhole, In Place Bid Item No. 12:
  - 1. Measurement will be made for each standard 4' diameter manhole installed.
  - 2. Payment will be made at the lump sum unit price bid for installing each manhole, 0' to 6' deep, which price shall include all excavation, removal, backfill, compaction, shoring, sheeting, dewatering, concrete, pipe, bedding, couplings, end caps, flanged coupling adapters or mechanical restraint systems, ring and cover, surface restoration including pavement replacement in kind, labor and incidentals.
- J. Alternate Minimum Bury Depth Alternate Bid Item No. 1:
  - 1. Measurement shall be made to the nearest linear foot of pipe installed at alternate minimum bury depth. The length of pipeline to be paid for shall be based upon measurement of the completed and accepted pipelines along the horizontal projections of the centerline of the pipe, less the fitting laying length.
  - 2. Payment will be made at the unit price bid per linear foot of pipe installed at alternate minimum bury depth of 60" below finished ground surface. This item shall represent the additional work required to complete trenching, backfilling, compaction, sheeting, shoring, earthwork, grading at the alternate minimum depth and will be paid in addition to Bid Item 8, 30" Ductile Iron Pipe. It will also include any additional rock excavation required to increase bury to the alternate bid depth.
- 1.07 PAYMENT ITEMS CONTRACT 1, BID PACKAGE 4 (125 PIPELINE):
  - A. 8" AWWA C-900 PVC Pipe, In Place Bid Items No. 1-3, Inclusive:
    - 1. Measurement shall be made to the nearest linear foot of pipe or restrained joint pipe installed. The length of pipeline to be paid for shall be based upon measurement of the completed and accepted pipelines along the horizontal projections of the centerline of the pipe, less the fitting laying length.
    - 2. Payment shall be made at the contract unit price bid per linear foot of pipe in place, completed and accepted. This price shall be deemed full compensation for mobilization, bonds, insurance, traffic control, erosion control, furnishing and installing all pipe, trenching, backfilling, compaction, directional drilling (if required), sheeting, shoring, earthwork, grading, joint materials, closure pieces, connection to adjoining pipe, cutting, polyethylene wrap (if required), tracer wire system (if required), bedding, jointing, testing, surface restoration and seeding, and any other incidental items

required to complete the pipe installation as detailed and specified.

- B. Rock Excavation Bid Item No. 4:
  - 1. Measurement will be made to the cubic yard for rock excavated and removed.
  - 2. Payment will be made at the unit price bid per cubic yard of rock removed. This item shall represent the additional work required to remove rock from the excavation and shall be paid in addition to Bid Items 1-3, inclusive, AWWA C-900 PVC Pipe.
- C. Fittings and Valves Bid Items No. 5-13, Inclusive:
  - 1. Measurement will be made by each fitting or valve of each type and size, completed and accepted.
  - 2. Payment will be made at the unit price bid for each type and size of fitting in place, which price shall include all labor, excavation, backfilling, compaction, sheeting, dewatering, mechanical joint restraint (where required), concrete blocking (where required), anchoring, setting, bedding, joint materials, polyethylene wrap (if required), tracer wire system (if required), jointing, strapping, valve stem and riser, testing and incidental items required to complete the installation.
- D. Type 2 Road Crossing, Bored In Place: Bid Item No. 14
  - 1. Measurement will be made by the linear foot for the installation of each encasement pipe, completed and accepted.
  - 2. Payment will be made at the unit price bid for the encasement pipe, which price shall include excavation of boring pit, tunneling or boring, encasement pipe, restrained joint carrier pipe, casing spacers, end seals, backfill and compaction of boring pit, dewatering, surface restoration and seeding, permitting, and other incidental items.
- E. Low Point Drain Bid Item No. 15:
  - 1. Measurement will be made for each low point drain setting furnished and installed at the locations shown on the Drawings, completed and accepted.
  - 2. Payment will be made at the unit price bid for each low point drain setting which price shall include excavation, backfill, compaction, precast manhole, manhole frame and cover, fittings, gate valves, concrete blocking, piping and any other incidental and appurtenant items required to complete the installation as detailed and specified.
- F. Air/Vacuum Valve Vault Bid Item No. 16:
  - 1. Measurement will be made for each air/vacuum valve and valve vault setting furnished and installed at the locations shown on the Drawings, completed and accepted.
  - 2. Payment will be made at the unit price bid for each air release/vacuum valve and vault setting which price shall include excavation, backfill, compaction, precast structure, access hatch or manhole ring and cover, pipe saddle, air release/vacuum valve and appurtenances, valve, piping and any other incidental and appurtenant items required to complete the installation as detailed and specified.
- G. Remove & Replace Gravel Surfacing: Bid Item No. 17:
  - 1. Measurement will be made at the price bid per square yard of gravel removed and replaced.
  - 2. This item includes the complete furnishing and installation of all materials and labor for the aggregate/gravel surfacing including but not limited to aggregate, earthwork, subgrade preparation, placing, compaction, removal of existing surfacing and all other items of work necessary to complete the work in accordance with the Contract Documents.
- H. Remove & Replace Asphaltic Concrete Pavement Bid Item 18:
  - 1. Measurement will be made at the price bid per square yard of asphaltic concrete pavement removed and replaced.

- 2. This item includes the complete furnishing and installation of all materials and labor for removal and installation asphaltic concrete pavement including but not limited to asphaltic concrete, concrete, aggregate base, earthwork, subgrade preparation, placing, jointing, compaction, removal of existing surfacing, tack coat, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- I. High Pressure Gas Main Crossing: Bid Item No. 19:
  - 1. Measurement will be made by the lump sum price for the installation of the pipeline through the easement and in the area of the high pressure natural gas pipelines identified in the Drawings, completed and accepted.
  - 2. Payment will be made for the completion of the pipeline through the easement and in the area of the high pressure natural gas pipelines identified in the Drawings, which price shall include additional excavation required, additional cost for nitrile gasket pipe, difficulties encountered due to work in and around foreign pipelines, coordination with utility owners, potholing (as required), gravel drive for crossing, permitting, and other incidental items.
- J. 10" PVC Pipe, Fittings, Crossings, and Appurtenances Alternate Bid Item No. A1.1-A1.19:
  - 1. Measurement shall be identical to complimentary items in base bid.
  - 2. Payment will be identical to complimentary items in base bid, for 10" pipe, fittings, crossings (including increased diameter of boring and associated casing pipe), and appurtenances. Pipe class, bury depth, and restraint requirements will be as specified for 8" base bid. If awarded, this alternate will be awarded with Contract 1, Bid Package 2, Alternate 1 Alternate Pump Configuration.
- K. 16" PVC Pipe, Fittings, Crossings, and Appurtenances Alternate Bid Item No. A2.1-A2.19:
  - 1. Measurement shall be identical to complimentary items in base bid.
  - 2. Payment will be identical to complimentary items in base bid, for 16" pipe, fittings, crossings (including increased diameter of boring and associated casing pipe), and appurtenances. Pipe bury depth and restraint requirements will be as specified for 8" base bid. All buried pipe will be AWWA C-900, Class 235 PVC. If awarded, this alternate will be awarded with Contract 1, Bid Package 2, Alternate 2 Alternate Pump Configuration.
- L. Alternate Minimum Bury Depth Alternate Bid Item No. A2.20:
  - 1. Measurement shall be made to the nearest linear foot of pipe installed at alternate minimum bury depth. The length of pipeline to be paid for shall be based upon measurement of the completed and accepted pipelines along the horizontal projections of the centerline of the pipe, less the fitting laying length.
  - 2. Payment will be made at the unit price bid per linear foot of pipe installed at alternate minimum bury depth of 60" below finished ground surface. This item shall represent the additional work required to complete trenching, backfilling, compaction, sheeting, shoring, earthwork, grading at the alternate minimum depth and will be paid in addition to Bid Items 1-4, 8" AWWA C-900 PVC Pipe or this item as modified by acceptance of alternate bid items above. It will also include any additional rock excavation required to increase bury to the alternate bid depth.
- 1.08 PAYMENT ITEMS CONTRACT 1, BID PACKAGE 5 (LAKE DURANGO PIPELINE):
  - A. 8" AWWA C-900 PVC Pipe, In Place Bid Items No. 1, Inclusive:
    - 1. Measurement shall be made to the nearest linear foot of pipe or restrained joint pipe installed. The length of pipeline to be paid for shall be based upon measurement of the completed and accepted pipelines along the horizontal projections of the centerline of the pipe, less the fitting laying length.
    - 2. Payment shall be made at the contract unit price bid per linear foot of pipe in place, completed and accepted. This price shall be deemed full compensation for mobilization, bonds, insurance, traffic control, erosion control, furnishing and installing all pipe, trenching, backfilling, compaction, sheeting, shoring, earthwork, grading, joint materials, closure pieces, connection to adjoining pipe,
cutting, polyethylene wrap (if required), tracer wire system (if required), bedding, jointing, testing, surface restoration and seeding, and any other incidental items required to complete the pipe installation as detailed and specified.

- B. Rock Excavation Bid Item No. 2:
  - 1. Measurement will be made to the cubic yard for rock excavated and removed.
  - 2. Payment will be made at the unit price bid per cubic yard of rock removed. This item shall represent the additional work required to remove rock from the excavation and shall be paid in addition to Bid Items 1-2, inclusive, AWWA C-900 PVC Pipe.
- C. Fittings and Valves Bid Items No. 3-7, Inclusive:
  - 1. Measurement will be made by each fitting or valve of each type and size, completed and accepted.
  - 2. Payment will be made at the unit price bid for each type and size of fitting in place, which price shall include all labor, excavation, backfilling, compaction, sheeting, dewatering, mechanical joint restraint (where required), concrete blocking (where required), anchoring, setting, bedding, joint materials, polyethylene wrap (if required), tracer wire system (if required), jointing, strapping, valve stem and riser, testing and incidental items required to complete the installation.
- D. Type 3 Road Crossing: Bid Item No. 8:
  - 1. Measurement will be made by the linear foot for the installation of each crossing, completed and accepted.
  - 2. Payment will be made at the unit price bid for the crossing pipe, which price shall include excavation, restrained joint pipe, backfill and compaction, dewatering, surface restoration and seeding, permitting, and other incidental items.
- E. Low Point Drain Bid Item No. 9:
  - 1. Measurement will be made for each low point drain setting furnished and installed at the locations shown on the Drawings, completed and accepted.
  - 2. Payment will be made at the unit price bid for each low point drain setting which price shall include excavation, backfill, compaction, precast manhole, manhole frame and cover, fittings, gate valves, concrete blocking, piping and any other incidental and appurtenant items required to complete the installation as detailed and specified.
- F. Fire Hydrant Assembly: Bid Item No. 10:
  - 1. Measurement will be made by each hydrant, completed and accepted.
  - 2. Payment will be made at the unit price bid for each hydrant, which price shall include furnishing and installing hydrant, all labor, excavation, backfilling, compaction, sheeting, dewatering, mechanical joint restraint (where required), concrete blocking (where required), anchoring, setting, bedding, joint materials, polyethylene wrap (if required), tracer wire system (if required), jointing, strapping, isolation valve stem and riser, pipe and connection to main, gravel drain, tee fitting, any required barrel extensions, testing and incidental items required to complete the installation.
- G. Air/Vacuum Valve Vault Bid Item No. 11:
  - 1. Measurement will be made for each air/vacuum valve and valve vault setting furnished and installed at the locations shown on the Drawings, completed and accepted.
  - 2. Payment will be made at the unit price bid for each air release/vacuum valve and vault setting which price shall include excavation, backfill, compaction, precast structure, access hatch or manhole ring and cover, pipe saddle, air release/vacuum valve and appurtenances, valve, piping and any other incidental and appurtenant items required to complete the installation as detailed and specified.
- H. Remove & Replace Gravel Surfacing: Bid Item No. 12:

- 1. Measurement will be made at the price bid per square yard of gravel removed and replaced.
- 2. This item includes the complete furnishing and installation of all materials and labor for the aggregate/gravel surfacing including but not limited to aggregate, earthwork, subgrade preparation, placing, compaction, removal of existing surfacing and all other items of work necessary to complete the work in accordance with the Contract Documents.
- I. Outlet Structure: Bid Item No. 13:
  - 1. Measurement will be made by the lump sum price for the construction of the outlet structure, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of construction of the outlet structure, including all materials and labor including but not limited to concrete outlet structure, riprap, aggregate, earthwork, subgrade preparation, placing, compaction, removal of existing surfacing, flap gate valve and all other items of work necessary to complete the work in accordance with the Contract Documents.
- J. Alternate Minimum Bury Depth Alternate Bid Item No. A1:
  - 1. Measurement shall be made to the nearest linear foot of pipe installed at alternate minimum bury depth. The length of pipeline to be paid for shall be based upon measurement of the completed and accepted pipelines along the horizontal projections of the centerline of the pipe, less the fitting laying length.
  - 2. Payment will be made at the unit price bid per linear foot of pipe installed at alternate minimum bury depth of 60" below finished ground surface. This item shall represent the additional work required to complete trenching, backfilling, compaction, sheeting, shoring, earthwork, grading at the alternate minimum depth and will be paid in addition to Bid Items 1-2, 8" AWWA C-900 PVC Pipe. It will also include any additional rock excavation required to increase bury to the alternate bid depth.

# 1.09 PAYMENT ITEMS – CONTRACT 2 (UNDERWATER INSTALLATION OF INTAKE SCREEN(S)):

- A. Upper Portal Screen Bid Item No. 1:
  - 1. Measurement will be made by the lump sum price for the installation of the upper intake cylindrical water intake screen at the intake structure, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the upper portal screen which price shall include the complete furnishing and installation of all materials, labor and equipment for the screen including but not limited to furnishing and underwater installation of intake screen, mobilization, bonds, insurance, piping, demolition, removal, and disposal of existing screen or cover, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- B. Lower Portal Screen Alternate Bid Item No. 1:
  - 1. Measurement will be made by the lump sum price for the installation of the lower intake cylindrical water intake screen at the intake structure, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for completion of the lower portal screen which price shall include the complete furnishing and installation of all materials, labor and equipment for the screen including but not limited to furnishing and underwater installation of intake screen, mobilization, bonds, insurance, piping, demolition, removal, and disposal of existing screen or cover, and all other items of work necessary to complete the work in accordance with the Contract Documents.
- 1.10 PAYMENT ITEMS CONTRACT 3 (LAKE DURANGO TREATED WATER PIPELINE):
  - A. Mobilization Bid Item No. 1:

- 1. Measurement will be made by lump sum for bonds, insurance, mobilization of equipment and labor to job site, and incidentals.
- 2. Payment will be made at the lump sum price bid for bonds, insurance, mobilization of equipment and labor to job site, and incidentals.
- B. 4" AWWA C-900 PVC Pipe, In Place Bid Item No. 2:
  - 1. Measurement shall be made to the nearest linear foot of pipe or restrained joint pipe installed. The length of pipeline to be paid for shall be based upon measurement of the completed and accepted pipelines along the horizontal projections of the centerline of the pipe, less the fitting laying length.
  - 2. Payment shall be made at the contract unit price bid per linear foot of pipe in place, completed and accepted. This price shall be deemed full compensation for mobilization, bonds, insurance, traffic control, erosion control, furnishing and installing all pipe, trenching, backfilling, compaction, sheeting, shoring, earthwork, grading, joint materials, closure pieces, connection to adjoining pipe, cutting, polyethylene wrap (if required), tracer wire system (if required), bedding, jointing, testing, surface restoration and seeding, and any other incidental items required to complete the pipe installation as detailed and specified.
- C. Rock Excavation Bid Item No. 3:
  - 1. Measurement will be made to the cubic yard for rock excavated and removed.
  - 2. Payment will be made at the unit price bid per cubic yard of rock removed. This item shall represent the additional work required to remove rock from the excavation and shall be paid in addition to Bid Items 1-2, inclusive, AWWA C-900 PVC Pipe.
- D. Fittings and Valves Bid Items No. 4-6, Inclusive:
  - 1. Measurement will be made by each fitting or valve of each type and size, completed and accepted.
  - 2. Payment will be made at the unit price bid for each type and size of fitting in place, which price shall include all labor, excavation, backfilling, compaction, sheeting, dewatering, mechanical joint restraint (where required), concrete blocking (where required), anchoring, setting, bedding, joint materials, polyethylene wrap (if required), tracer wire system (if required), jointing, strapping, valve stem and riser, testing and incidental items required to complete the installation.
- E. Connection to Existing Bid Item No. 7:
  - 1. Measurement will be made by the lump sum for the demolition, modification and connections to existing structures, completed and accepted.
  - 2. Payment will be made at the lump sum price bid for connections to the existing pipeline, which price shall include all excavation, installation, backfill, and compaction, labor, equipment, and incidentals.
- F. Air/Vacuum Valve Bid Item No. 8:
  - 1. Measurement will be made for each air/vacuum valve and valve vault setting furnished and installed at the locations shown on the Drawings, completed and accepted.
  - 2. Payment will be made at the unit price bid for each air release/vacuum valve and vault setting which price shall include excavation, backfill, compaction, precast structure, access hatch or manhole ring and cover, pipe saddle, air release/vacuum valve and appurtenances, valve, piping and any other incidental and appurtenant items required to complete the installation as detailed and specified.
- G. New Meter Installation Bid Item No. 9:
  - 1. Measurement will be made for each meter setting furnished and installed at the locations shown on the Drawings, completed and accepted.
  - 2. Payment will be made at the unit price bid for each meter setting which price shall include excavation, backfill, compaction, meter box, tandem meter setter, installation of Owner-provided positive displacement meter, pressure regulator, saddle tap, corporation stop, service line for

connection between mainline and new meter setting (length as required) and for connection between new meter setting and existing household service line, excavation, placement and backfilling.

- H. 2 <sup>1</sup>/<sub>2</sub>" Flush Hydrant: Bid Item No. 10:
  - 1. Measurement will be made by each hydrant, completed and accepted.
  - 2. Payment will be made at the unit price bid for each hydrant, which price shall include furnishing and installing hydrant, all labor, excavation, backfilling, compaction, sheeting, dewatering, mechanical joint restraint (where required), concrete blocking (where required), anchoring, setting, bedding, joint materials, polyethylene wrap (if required), tracer wire system (if required), jointing, strapping, isolation valve stem and riser, pipe and connection to main, gravel drain, testing and incidental items required to complete the installation.
- I. Deduct for Concurrent Award of Contract 1 Alternate Bid Item No. 1:
  - 1. Measurement will be made by the lump sum price for the efficiencies and economies of scale recognized by the Contractor due to concurrent award of Contracts 1 and 3.
  - 2. Payment will be made at the lump sum price bid for the efficiencies and economies of scale recognized by the Contractor due to concurrent award of Contracts 1 and 3. From the beginning of the project, up to 50% of each Application for Payment will utilize credit from this Bid Item until the bid amount is fully consumed by project costs.
- PART 2 PRODUCTS (NOT USED)
- PART 3 EXECUTION (NOT USED)

END OF SECTION

# SECTION 099100 PAINTING

# PART 1 GENERAL

# 1.01 SUMMARY

A. This Section consists of painting and surface preparation shown in the Drawings, specified herein and as required for a complete installation.

# 1.02 GENERAL INFORMATION AND DESCRIPTION

- A. The term "paint", as used herein, includes emulsions, paints, stains, varnishes, sealers, cement filler, cement-latex filler and other coatings, whether used as prime, intermediate, or finish coats.
- B. Unless otherwise specified in the Drawings, all buildings, facilities, structures, and appurtenances, as indicated on the Drawings and as specified herein, shall be painted with not less than one shop coat and two field coats, or one prime coat and two finish coats of the appropriate paint. Items to be painted include, but are not limited to exterior and interior concrete walls, precast concrete panels, structural steel, miscellaneous metals, steel doors and frames, all gypsum drywall, pipe fittings, valves, mechanical equipment, motors, conduit, and all other work which is obviously required to be painted unless otherwise specified.
- C. Baked-on enamel finishes and items with standard shop finishes such as graphic panels, electrical equipment, instrumentation, etc., shall not be field painted unless the finish is damaged during shipment or installation. Aluminum, stainless steel, fiberglass and bronze work shall not be painted unless color coding and marking is required or otherwise specified. A list of surfaces not to be coated is included in Article 3.07.
- D. Finish material for flooring shall either be painted as specified in 1.02 B in the section or a concrete sealant approved by the engineer and applied as specified by the manufacturer.

# 1.03 REFERENCES

- A. Steel Structures Painting Council:
  - 1. SSPC-SP5 No. 6 Commercial Blast Cleaning.
  - 2. SSPC-SP10 No. 10 Near-White Blast Cleaning.

# 1.04 SUBMITTALS

- A. Manufacturer's standard color charts and any project specific colors specified herein.
- B. List of paint proposed for use on each item to be painted. Include description of each type of paint, manufacturer's data sheets, name of manufacturer, and manufacturer's instructions for thickness of coats.

- C. Certificates of Compliance: Except for lead-based metal primers for use in concealed spaces, the contractor shall furnish a certificate of compliance attesting that all paints proposed for use contain no more than 0.06% lead as defined in paragraph HAZARDOUS MATERIALS RESTRICTIONS.
- D. Manufacturer's Instructions: Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing time and drying time between coats shall be furnished for epoxy, polyester-epoxy, and moisture cure polyurethane.
- E. The Contractor shall prepare a complete schedule of surfaces to be coated and shall identify the surface preparation and paint system he proposes to use. The Paint Schedule shall be in conformance with Article 3.04. The schedule shall contain the name of the paint manufacturer, and the name, address and telephone number of the manufacturer's representative that will inspect the Work. The schedule shall be submitted to the Engineer for review as soon as possible following the Notice to Proceed so that the schedule may be used to identify colors and to specify shop painting systems on order for fabricated equipment.

# 1.05 SERVICES OF MANUFACTURERS REPRESENTATIVE

A. The Contractor shall purchase paint from an acceptable manufacturer. The manufacturer shall assign a representative to inspect the application of his product both in the shop and field. The Contractor, through the manufacturer's representative, shall submit his report to the Engineer at the completion of his Work identifying the products used and verifying that said products were properly applied and that the paint systems were proper for the exposure and service.

# 1.06 QUALITY ASSURANCE

- A. General:
  - 1. The contractor shall give the engineer a minimum of three days advance notice of the start of any field surface preparation work of coating application work.
  - 2. All such Work shall be performed only in the presence of the Engineer, unless the Engineer has specifically allowed the performance of such Work in his absence.
  - 3. Review by the Engineer, or the waiver of review of any particular portion of the Work, shall not relieve the Contractor of his responsibility to perform the Work in accordance with these Specifications.
- B. Subcontractors: Where protective coatings are to be performed by a subcontractor, the Contractor shall provide five references which show that the painting subcontractor has previous successful experience with the specified or comparable coating systems. Include the name, address, and the telephone number for the owner of each installation for which the painting subcontractor provided the protective coating.

# 1.07 SAFETY AND HEALTH REQUIREMENTS

A. In accordance with requirements of OSHA Safety and Health Standards for Construction (29CFR1926) and the applicable requirements of regulatory agencies having jurisdiction, as well as manufacturer's

printed instructions, appropriate technical bulletins, manuals, and material safety data sheets, the Contractor shall provide and require use of personnel protective and safety equipment for persons working in or about the project site.

B. All paints must comply with the requirements of the National Ambient Air Quality Standards.

# 1.08 PRODUCTS DELIVERY, STORAGE AND HANDLING

- A. Deliver paints to project in unopened containers listing manufacturer's name, type of paint, manufacturer's stock number, color and instructions for reducing, where applicable.
- B. Store only acceptable project materials on project site.
- C. Store only in a suitable location and temperature within the paint manufacturers recommendations.
- D. Comply with health and fire regulations.
- E. Protect work of others and surfaces not being worked on by use of adequate drop cloths.

# 1.09 ENVIRONMENTAL CONDITIONS

- A. The ambient temperature shall be between 45 and 95 degrees F. when applying coatings unless otherwise recommended by the paint manufacturer. The substrate temperature must be 5 degrees F. or more above the dew point temperature while painting and during coating cure.
- B. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of surface moisture as determined by sight or touch.
- C. In no case shall paint be applied to surfaces upon which there is visible frost or ice.

# 1.10 PIPING IDENTIFICATION

- A. The Contractor shall paint all piping, valves, equipment, exposed conduit and all appurtenances which are integral to a complete functional mechanical pipe and electrical conduit system and identified with lettering or tags designating the service of each piping system. Piping not scheduled to be color coded shall be painted to match adjacent wall or ceiling surfaces or existing piping in the area.
- B. In general, the pumps and equipment shall be painted the same color as the piping system to which it is connected unless otherwise directed by the Engineer. Where colors are not designated for piping and conduit systems below, they will be selected during the shop drawing review.
- C. Banding. Where bands are indicated in the Color Coding Schedule, the pipe shall be painted for its full circumference with a band of the color indicated. The bands shall be six inched wide, neatly made by masking, and spaced eight feet apart. The Contractor may substitute precut prefinished bands on piping subject to acceptance by the Engineer. Where banded pipes are running concurrently in a space, bands shall be located so that on adjacently located pipes, bands will be grouped beside each other.

- D. The Contractor shall apply identification titles and arrows indicating the direction of flow of liquids to all types and sections of piping. Titles shall be as directed by the Engineer. Identification titles shall be located midway between color coding bands where possible. Identification lettering and arrows shall be provided near equipment served, adjacent to valves, at each branch or tee, and directly adjacent to each side of any wall or slab the pipeline passes through. Titles shall be properly inclined to the pipe axis to facilitate easy reading from operating positions. If, in the opinion of the Engineer, the foregoing requirements will result in excessive numbers of labels or arrows on a run of pipe, the number required shall be reduced as directed. Flow arrows shall be provided adjacent to titles to indicate the direction of flow of materials under normal operating conditions.
- E. The titles shall identify the contents by complete name at least once in each area through which it passes and thereafter be abbreviated.
- F. The numbers and letters shall be die-cut from pressure sensitive minimum 3.5 mil vinyl film prespace on carrier tape. Adhesive and finish surface shall be protected with one piece removable lines. Color shall be black on white as directed and shall have an overall height in inches in accordance with the subsection entitled "Letter Size".

# 1.11 COLOR CODING AND LETTERING SCHEDULE

A. Piping color and lettering shall be in accordance with the following schedule:

	Color		
Material	Pipe	Letters & Arrows	Legend
Raw Water	Olive	Black	Raw Water
Air	Light Green	Black	Air
Natural Gas	Red w/black bands	Black	Gas

B. In addition, special painting of the following items will be required:

Item	Color

Valve Handwheels & Levers

Red

## 1.12 LETTER SIZE

Letter size shall be as follows:

Outside diameter of pipe or pipe covering	Min. Width of Color Band	Size of Legend letters and numerals		
3/4" to 1-1/4"	8"	1/2"		
1-1/2" to 2"	8″	3/4"		
2-1/2" to 6"	12"	1- 1/4"		
8" to 10"	24"	2-1/2"		
Over 10"	32"	3- 1/2		

Notes:

1. Letter type shall be Helvetica Medium upper case. The manufacturer's instructions shall be followed in respect to storage, surface preparation and application.

2. For piping less than ¾ inch diameter, the Contractor shall furnish and attach corrosion resistant color "snap on" plastic sleeves with the required lettering.

# 1.13 HAZARDOUS MATERIALS RESTRICTIONS

A. Lead: paint shall contain not more than 0.06% lead by weight (calculated as lead metal) in the total nonvolatile content of the paint except lead-based metal primers as hereinbefore specified may be used in concealed spaces.

# 1.14 PACKAGING, LABELING AND STORAGE

A. Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacturer, manufacturer's formulation number, manufacturer's directions, including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paint shall be stored on the project site or segregated at the source of supply sufficiently in advance of need to allow 30 days for testing. Emulsion paints shall be stored to prevent freezing.

# 1.15 QUALITY WORKMANSHIP

A. The Contractor shall be responsible for the cleanliness of his painting operations and shall use covers and masking tape to protect the work whenever such covering is necessary, or if so requested by the Owner. Any unwanted paint shall be carefully removed without damage to any finished paint or surface. If damage does occur, the entire surface, adjacent to and including the damaged area, shall be repainted without visible lapmarks and without additional cost to the Owner. B. Painting found defective shall be scraped or sandblasted off and repainted as the Owner may direct. Before final acceptance of the work, damaged surfaces of paint shall be cleaned and repainted as directed by the Owner.

# 1.16 ADDITIONAL PAINT

A. At the end of the project, the Contractor shall turn over to the Owner a gallon can of each type and color of paint, primer, thinner or other coating used in the field painting. If the manufacturer packages the material concerned in gallon cans, then it shall be delivered in unopened labeled cans as it comes from the factory. If the manufacturer does not package the material in gallon cans, and in the case of special colors, the materials shall be delivered in new gallon containers, properly closed with typed labels indicating brand, type, color, etc. The manufacturer's literature describing the materials and giving directions for their use shall be furnished in three bound copies. A type-written inventory list shall be furnished at the time of delivery.

# PART 2 PRODUCTS

# 2.01 PAINT - PIPING

- A. Paints listed in the Application Schedule are manufactured by Tnemec Company, Inc. Approved equal coating systems and products of Sherwin-Williams may be furnished.
- B. Materials selected for coating systems for each type of surface shall be the product of a single manufacturer.
- C. All paint used for intermediate and finish coats shall be guaranteed by the paint manufacturer to be fume-proof and suitable for sewage plant atmosphere containing hydrogen sulfide. Any paint that cannot be so guaranteed shall not be used. Paint shall be lead-free and mercury-free if available, but in no case shall the lead or mercury content cause discoloration in sewage plant atmosphere.

# 2.02 COLORS

- A. All colors shall be as designated by the Engineer/Architect at the shop drawing review. The Contractor shall submit color samples to the Engineer as specified in Submittals section. The Contractor shall submit suitable samples of all colors and finishes for the surfaces to be painted. The Engineer shall decide upon the choice of colors and other finishes when alternates exist. No variation shall be made in colors without the acceptance of the Owner. Color names and/or numbers shall be identified according to the appropriated color chart issued by the manufacturer of the particular product in question. Engineer will provide a schedule of all colors of paints and coatings required.
- B. Mix paints to match tints specified in the color schedule.

# PART 3 EXECUTION

# 3.01 PREPARATION OF SURFACES

- A. General: Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Surfaces to be painted shall be clean before applying paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.
- B. All new surfaces to be coated shall be thoroughly cleaned of all dust and debris. Existing painted surfaces to be recoated shall be thoroughly cleaned to remove all loose or unbonded paint prior to application of new coatings. All existing painted ferrous surfaces to be recoated shall have their surfaces roughened, spot primed and cleaned prior to application of new top coat.
- C. Ferrous Surfaces Non Submerged or Not Exposed to Sewage: Ferrous surfaces that have not been shop-coated shall be solvent cleaned. Unpainted surfaces that contain loose rust, loose mill scale and other foreign substances shall be mechanically cleaned by power wire brushing or sandblasting. Minor amounts of residual rust that cannot be removed except by thorough blast-cleaning, and tight mill scale that cannot be removed by applying a sharp knife to any edge, will be allowed to remain. After cleaning, one coat of the specified primer shall be applied to all ferrous surfaces to be painted. Shop coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.
- D. Ferrous surfaces (exterior surfaces above ground & submerged or exposed to sewage) field preparation Steel surfaces shall be cleaned of mill scale, paint, rust and foreign matter by blast cleaning in accordance with Steel Structures Painting Council Surface Preparation Specification No. SSPC-SP10-Near-White Blast Cleaning.
- E. Remove hardware, electrical device plates, register faces, and other removable trim.
- F. Apply protective masking and/or covering to electrical components and other fixed items not to be painted.
- G. Damaged or abraded areas on shop primed ferrous metal shall be sandpapered or wire brushed clean and painted with one coat of rust inhibitive primer.
- H. Galvanized metal surfaces, copper and other non-ferrous surfaces shall have surface deposits removed with xylolo-naptha and wiped clean and dry with clean cloths and treated with vinyl wash primer.
- I. Concrete and masonry shall be clean and dry to permit uniform penetration. Minimum 28 day cure. Clean off any scale, mud, loose paint or efflorescence with a stiff brush.
- J. Existing work, where scheduled for repainting, shall be put in condition to provide good adhesion and to receive paint.

# 3.02 APPLICATION OF PAINT

- A. Apply paints only in dust-free atmosphere.
- B. All paint materials shall be evenly spread to cover and hide the underlying surface without holidays, thin spots, runs, drips, sags or fat edges.
- C. Apply succeeding coats only over thoroughly dry previous coats.
- D. Enamels shall be lightly sanded between coats.
- E. Enamel coats shall flow on level without ropiness or brush marks.
- F. Paints shall be applied in the thickness and methods recommended by the manufacturer.
- G. Time between Surface Preparation and Painting: Surfaces that have been cleaned, pre-treated and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practicable after such pre-treatment has been completed, but prior to any deterioration of the prepared surface.

# 3.03 FACTORY OR SHOP-PAINTED ITEMS

- A. Surfaces of items finish-painted by the manufacturer, or specified to be finish-painted under other sections of the specifications, are exempted from the requirements for surface preparation and painting. Shop-primed items shall receive surface preparation and finish painting as required by this section.
- B. All factory prime painting shall be touched up for elimination of all abraded and scratched areas, rendering surfaces suitable for finish painting. All factory finish painting shall be touched up to provide acceptable finish painting. Mismatching of touch-up color and surface or equipment painted with non-desirable colors shall be repainted.

# 3.04 APPLICATION SCHEDULE

- A. General: Apply the paints and finishes to the respective new surfaces as scheduled in the table at the end of this section.
  - 1. Piping shall not be painted until the piping has been tested and approved.
  - 2. Shop Painted Items: Surfaces of fabricated and assembled items that are finish-painted by the manufacturer, or specified to be finish-painted under other sections of the specifications, are exempted from the following schedule requirements for surface preparation and painting. Shop-primed items shall receive surface preparation and finish painting as required by this section.
  - 3. Existing painted surfaces noted to be painted shall have all repaired or new areas primed and coated as scheduled and remainder of surfaces in good paint condition need receive only the final coat.

4. Dry film thickness per coat shall be as specified by the paint manufacture. Surfaces that do not meet the manufacturer's dry film thickness will be required to be repainted prior to the application of the final coat at no additional charge to the owner.

# 3.05 ANSI AND OSHA SAFETY COLORS

- A. Items specified in the following shall be finish color coated as specified. ANSI colors shall conform with (OSHA) ANSI Z53.1-1971 and latest revisions. Color coating shall be with the system specified for the equipment, concrete, etc. Where the coating system is not specified and color coating is required, the items shall be coated with a primer and two coats Glid-Guard Alkyd Industrial Enamel, or equal.
  - Red: Items listed in ANSI Z53.1-1971, Section 2.1 shall be painted ANSI Red. In general, these items shall include fire protection equipment and apparatus; wall mounted breathing apparatus, danger signs and locations; and stop bars, buttons or switches. In addition all hose valves and riser pipes, fire protection piping and sprinkler systems, and electrical stop switches shall be painted ANSI Red.
  - Orange: Items listed in ANSI Z53.1-1971, Section 2.2 shall be painted ANSI Orange. ANSI Orange shall be used as a basic color for designating dangerous parts of machines or energized equipment which may cut, crush, shock, or otherwise injure and to emphasize such hazards when enclosure doors are open or when gear belt or other guards around moving equipment are open or removed, exposing unguarded hazards. In addition, moving machinery having a linear or peripheral speed in excess of 10 feet per minute, which is either inadequately guarded due to physical problems or may be operated with the guard removed, rims or sprockets, gears, pulleys, etc.; crossheads of large engines and compressors; and flywheels shall be coated ANSI Orange.
  - Yellow: Items listed in ANSI Z53.1-1971, Section 2.3 shall be painted ANSI Yellow. Yellow shall be the basic color for designating caution and for making physical hazards such as striking against, stumbling, falling, tripping, and "caught in between". In addition, an 8-inch wide strip on the top and bottom tread of stairways shall be coated.
  - Green: Items listed in ANSI Z53.1-1971, Section 2.4 shall be painted ANSI Green. Green shall be the basic color for designating safety and the location of first-aid kits, eye wash facilities, and safety deluge showers shall be coated with ANSI Green.
  - Blue: Blue shall be used for designating caution, limited to warning against the starting, the use of, or the movement of equipment under repair or being worked upon.
  - Purple: Items listed in ANSI Z53.1-1971, Section 2.5 shall be painted ANSI Purple. In general, atomic sludge density meters shall be coated ANSI Purple.

# 3.06 GALVANIZED METAL TOUCH-UP

- Provide SSPC-SP1 surface preparation. Coat with Rust-Oleum Zinc Rich "Cold Galvanizing compound",
  3-mils DFT minimum.
- 3.07 SURFACES NOT REQUIRING PAINTING. The following listed items will not require painting.
  - A. Prefinished items not to be painted include, but are not limited to, the following factory-finished components:
    - 1. Shop finished mechanical and electrical equipment.
    - 2. Light fixtures.
    - 3. Motor Control Center and Switchgear.
    - 4. Metal Building Walls (Interior and Exterior) and Roof Panels.
  - B. Finished metal surfaces not to be painted include:
    - 1. Aluminum. (when not in contact with concrete.)
    - 2. Stainless steel.
    - 3. Galvanized steel. (Except as required to coat exposed ends created by field cutting.)
    - 4. Chromium plated.
    - 5. Copper pipe, except for mechanical identification.
  - C. Operating parts not to be painted include moving parts of operating equipment, such as the following:
    - 1. Valve and damper operators.
    - 2. Linkages.
    - 3. Sensing devices.
    - 4. Motor and fan shafts.
    - 5. Flexible couplings, lubricated bearing surfaces, insulation and plastic pipe and conduit.
    - 6. Packing glands and other adjustable parts of mechanical equipment.
  - D. Miscellaneous items such as the following:
    - 1. Finish hardware
    - 2. Plastic switch plates and receptacle plates.
    - 3. Aluminum doors and windows.
  - E. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

F. Touch-up paint pre-finished items if coating or surfaces are damaged during construction.

# 3.08 MISCELLANEOUS

A. Installation of Removed Items: Following completion of painting of each space, removed items shall be reinstalled by workmen skilled in the trade involved.

# 3.09 CLEANING

- A. The Contractor shall protect at all times, in areas where painting is being done, floors, materials of other crafts, equipment, vehicles, fixtures, and finished surfaces adjacent to the paint work. Cover all electrical plates, surface hardware, nameplates, gauge glasses, etc., before start of painting work.
- B. Touch up and restore finish where damaged.
- C. Remove spilled, splashed or splattered paint from all surfaces.
- D. All damaged hardware and other items shall be replaced.
- E. Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging scaffolding and containers shall be removed from the site or destroyed in an approved manner. Paint and other deposits upon adjacent surfaces shall be removed and the entire job left clean and acceptable.

# 3.10 PROTECTION OF MACHINERY, FLOORS AND EQUIPMENT

- A. Drop cloths shall be used to protect machinery, finished floors and equipment.
- 3.11 PAINTING FIRE PRECAUTION
  - A. Painting with flammable paint shall not be done in the vicinity of a welding operation or any other open flame.

	PAINT SY STEMS SC HEDULE								
	(Utilizing Tnemec Paints)								
	System	Description	Surface	Prime Coat		Intermediate Coat		Final Coat	
	No.		Preparation	Series	Min. DFT	Series	Min. DFT	Series	DFT
	1	Exterior Metal - Architectural	SSPC SP3	10	4.0 to 6.0	6	2.0 to 3.0	6	2.0 to 3.0
*	2	Exterior Metal - Corrosive	SPC 996	66-1211	2.0 to 3.0	66	2.0 to 3.0	73	2.0 to 3.0
*	3	Exterior Galv. Metal	SSPC SP1 & brush blast	66-1211	4.0 to 6.0	66	2.0 to 3.0	73	2.0 to 3.0
*	4	Exterior Concrete - Architectural	28 day cure	130	60 to 80 ft2/gal	6	2.0 to 3.0	6	2.0 to 3.0
*	4	Exterior Concrete	14 day cure & clean and dry	156	4.0 to 8.0			156	4.0 to 8.0
*	5	Exterior Buried Concrete	14 day cure & clean and dry	46-465	8.0 to 12.0			46-465	8.0 to 12.0
*	6	Exterior Masonry	28 day cure & clean and dry	130	60 to 80 ft2/gal	156	4.0 to 8.0	156	4.0 to 8.0
	7	Exterior Wood	sand & no residues	36	2.0 to 3.0	6	2.0 to 3.0	6	2.0 to 3.0
	8	Exterior Pipe and Equipment	SSPC SP6, See Note 2 for DIP	66-1211	3.0 to 5.0	66	4.0 to 6.0	73	4.0 to 6.0
*	9	Exterior PVC and FRP	Lightly Abrade	66	2.0 to 3.0			73	1.0 to 2.0
*	10	Buried Metal	SPC SP10	46H-413	14.0 to 20.0				
	11	Aluminum in Contact with Concrete	SPC P6	46-465	8.0 to 12.0			46-465	8.0 to 12.0
*	12	Submerged Metal - Potable	SPC SP10	20-1255	3.0 to 5.0			20-WH02	4.0 to 6.0
	13	Submerged Metal - Nonpotable	SPC SP10	66-1211	3.0 to 5.0	66	4.0 to 6.0	46H-413	14.0 to 20.0
*	14	Submerged Concrete - Potable	28 day cure & brush blast	20-1211	4.0 to 6.0	20-1255	4.0 to 6.0	20-WH02	4.0 to 6.0
*	15	Submerged Concrete - Nonpotable	28 day cure & brush blast	66	4.0 to 6.0	66	4.0 to 6.0	66	4.0 to 6.0
	16	Metal High Temp	SPC SP10	39	.7 to 1.5	39	0.7 to 1.5	39	0.7 to 1.5
	17	Interior Metal - Architectural	SPC SP3	10	2.0 to 3.5	6	2.0 to 3.0	6	2.0 to 3.0
*	18	Interior Metal - Corrosive	SPC 976	66	2.0 to 3.0	66	3.0 to 5.0	66	3.0 to 5.0
	19	Interior Galv. Metal	SPC SP1 & brush blast	27	4.0 to 6.0			73	2.0 to 3.0
*	20	Interior Concrete - Architectural	28 day cure & clean and dry	6	2.0 to 3.0			6	2.0 to 3.0
*	21	Interior Concrete -Corrosive	28 day cure & brush blast	66-1211	4.0 to 6.0			66	4.0 to 6.0
*	22	Concrete Floor Painted	28 day cure & brush blast	201	6.0 to 8.0	280	8.0 to 10.0	280	8.0 to 10.0
	23	Concrete Floor Clear Sealer	28 day cure & brush blast	201	10.0 to 12.0				
*	24	Interior Masonry - Architectural	28 day cure	130	60 to 80 ft2/gal	6	2.0 to 3.0	6	2.0 to 3.0
*	25	Interior Masonry - Corrosive	28 day cure	130	60 to 80 ft2/gal	66	4.0 to 6.0	66	4.0 to 6.0
*	26	Interior Wood	sand & no residues	36	2.0 to 3.0	6	2.0 to 3.0	6	2.0 to 3.0
*	27	Interior Gypsum Drywall	See Spec. 092116	51-792	1.0 to 2.0	6	1.5 to 2.0	6	1.5 to 2.0
*	28	Sound Absorption Panels	No residues	66-1211	3.0 to 5.0	66	4.0 to 6.0		
	29	Interior Pipe and Equipment (1)	SPC SP6, See Note 2 for DIP	66-1211	3.0 to 5.0	66	4.0 to 6.0	66	4.0 to 6.0
	30	Interior PVC and FRP	Lightly Abrade	66-1211	2.0 to 3.0			66	2.0 to 3.0
	31	Electrical Conduit Runs, Metalic Tubing	SPC SP6	37	2.0 to 3.5	Match	Wall	Match	Wall
*	32	Cotton/Canvason Pipe Insulation		6	1.5 to 2.0			6	1.5 to 2.0
*	33	Submerged Metal - Zinc Primer	SPC SP10	91-H2O	2.5 to 3.5	20-1255	4.0 to 6.0	20-WH02	4.0 to 6.0
*	34	Metal Corrosive - Zinc Primer	SSPC SP6	91-H2O	2.5 to 3.5	66	3.0 to 5.0	66	3.0 to 5.0
*	35	Interior Gypsum Drywall - Epoxy	See Spec. 092116	151-1051	1.0 to 2.0	84	3.0 to 4.0	84	3.0 to 8.0
*	36	Exterior Metal - Architectural, Epoxy	SPC SP 3	27	4.0 to 6.0			73	2.0 to 3.0
*	37	Interior Metal - Architectural, Epoxy	SPC 99 3	27	4.0 to 6.0			73	2.0 to 3.0
	Notes:								
*	* Paint sytem not used on this project.								
1.	1. Unless otherwise specified.								
2.	2. Surface prep shall be in compliance with Tnemec Techniacal Bulletin No. 07-52. If surface profile is less than 1.5 mils then brush-off blast clean,								

END OF SECTION

# SECTION 262416

## PANELBOARDS

#### PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 DEFINITIONS

- A. SVR: Suppressed voltage rating.
- B. TVSS: Transient voltage surge suppressor.

#### 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  - 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. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.

## 1.04 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

## 1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Include the following:
  - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

# 1.06 MAINTENANCE MATERIAL SUBMITTALS

1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- a. Keys: Two spares for each type of panelboard cabinet lock.
- b. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.
- c. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
- d. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

# 1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. 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.
- E. Comply with NEMA PB 1.
- F. Comply with NFPA 70.
- 1.08 DELIVERY, STORAGE, AND HANDLING
  - A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
  - B. Handle and prepare panelboards for installation according to NEMA PB 1.

## 1.09 PROJECT CONDITIONS

- A. Environmental Limitations:
  - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary 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 minus 22 deg F to plus 104 deg F.
    - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet.

- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Engineer no fewer than two days in advance of proposed interruption of electric service.
  - 2. Do not proceed with interruption of electric service without Owner's written permission.
  - 3. Comply with NFPA 70E.

#### 1.10 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

## 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

#### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Enclosures: Flush- and surface-mounted 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.
    - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
  - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
  - 4. Finishes:
    - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Same finish as panels and trim.
    - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
  - 5. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses:
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- E. 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.
  - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

## 2.02 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of service entrance distribution panelboards, complying with UL 1449 SPD Type 1.

# 2.03 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. Siemens Energy & Automation, Inc.
  - 3. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  - 1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: As Indicated
- 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; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- G. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features: Based on Square D Power Logic Series 800 or Cutler Hammer IQ Data

- 1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
  - a. Phase Currents, Each Phase: Plus or minus 1 percent.
  - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
  - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
  - d. Megawatts: Plus or minus 2 percent.
  - e. Megavars: Plus or minus 2 percent.
  - f. Power Factor: Plus or minus 2 percent.
  - g. Frequency: Plus or minus 0.5 percent.
  - h. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
  - i. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from five to 60 minutes.
  - j. Contact devices to operate remote impulse-totalizing demand meter.
- 2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.
- 3. Must be capable of connection to SCADA system, coordinate with controls contractor.
- 2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    - 2. Siemens Energy & Automation, Inc.
    - 3. Square D; a brand of Schneider Electric.
  - B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
  - C. Mains: As indicated.
  - 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.

# 2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. Siemens Energy & Automation, Inc.
  - 3. Square D; a brand of Schneider Electric.
- B. 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. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.

- b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
- 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. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
  - 1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Division 26 Section "Fuses."
  - 2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
  - 3. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.

# 2.06 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Mount top of trim 72 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.

- G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- I. Comply with NECA 1.

# 3.03 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- 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 distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

# 3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. 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.
- D. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- E. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.

- c. Instruments and Equipment:
  - (1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- F. Panelboards will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- 3.05 ADJUSTING
  - A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
- 3.06 PROTECTION
  - A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

# SECTION 262923

## VARIABLE-FREQUENCY MOTOR CONTROLLERS

#### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 DEFINITIONS

- A. BAS: Building automation system.
- B. CE: Conformite Europeene (European Compliance).
- C. CPT: Control power transformer.
- D. EMI: Electromagnetic interference.
- E. LED: Light-emitting diode.
- F. NC: Normally closed.
- G. NO: Normally open.
- H. OCPD: Overcurrent protective device.
- I. PID: Control action, proportional plus integral plus derivative.
- J. RFI: Radio-frequency interference.
- K. VFC: Variable-frequency motor controller.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type and rating of VFC indicated.
  - 1. Include dimensions and finishes for VFCs.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For each VFC indicated.
  - a. Include mounting and attachment details.
  - b. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - c. Include diagrams for power, signal, and control wiring.

# 1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFCs to include in emergency, operation, and maintenance manuals.

Include the following:

- a. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and MCP trip settings.
- b. Manufacturer's written instructions for setting field-adjustable overload relays.
- c. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
- d. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
- e. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate, full-load currents.
- f. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

## 1.05 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. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
  - 3. Indicating Lights: Two of each type and color installed.
  - 4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
  - 5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

## 1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

# 1.07 DELIVERY, STORAGE, AND HANDLING

- A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items.

# 1.08 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

# PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ABB Power Distribution, Inc.; ABB Control, Inc., Subsidiary (Model ACH 550).
  - 2. Eaton Electrical Sector; Eaton Corporation; Cutler-Hammer Business Unit (smaller than 100 HP Model HVX9000, 100 HP and larger Model CPX9000).
  - 3. Rockwell Automation, Inc; Allen-Bradley Brand (Model 700).

#### 2.02 SYSTEM DESCRIPTION

- A. General Requirements for VFCs:
  - 1. VFCs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508A.
- B. Application: Constant torque.
- C. VFC Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.
  - Units suitable for operation of NEMA MG 1, Design A and Design B motors, as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
  - 2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
  - 3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.
- D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.
  - 1. Units serving motors smaller than 100 HP shall be 6-pulse or 18-pulse type VFC.
  - 2. Units serving motors 100 HP and larger shall be 18-pulse VFC.
- E. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range.
- F. Unit Operating Requirements:
  - 1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
  - 2. Input AC Voltage Unbalance: Not exceeding 3 percent.
  - 3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
  - 4. Minimum Efficiency: 96 percent at 60 Hz, full load.
  - 5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
  - 6. Minimum Short-Circuit Current (Withstand) Rating: 65 kA.

- 7. Ambient Temperature Rating: Not less than 32 deg F and not exceeding 104 deg F.
- 8. Humidity Rating: Less than 95 percent (noncondensing).
- 9. Altitude Rating: Not exceeding 3300 feet.
- 10. Vibration Withstand: Comply with NEMA ICS 61800-2.
- 11. Overload Capability: 1.1 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
- 12. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
- 13. Speed Regulation: Plus or minus 5 percent.
- 14. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
- 15. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.
- G. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.
- H. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.
  - 1. Signal: Pneumatic.
- I. Internal Adjustability Capabilities:
  - 1. Minimum Speed: 5 to 25 percent of maximum rpm.
  - 2. Maximum Speed: 80 to 100 percent of maximum rpm.
  - 3. Acceleration: 0.1 to 999.9 seconds.
  - 4. Deceleration: 0.1 to 999.9 seconds.
  - 5. Current Limit: 30 to minimum of 150 percent of maximum rating.
- J. Self-Protection and Reliability Features:
  - 1. Surge Suppression: Factory installed as an integral part of the VFC, complying with UL 1449 SPD, Type 1 or Type 2.
  - 2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
  - 3. Under- and overvoltage trips.
  - 4. Inverter overcurrent trips.
  - 5. VFC and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
  - 6. Critical frequency rejection, with three selectable, adjustable deadbands.
  - 7. Instantaneous line-to-line and line-to-ground overcurrent trips.
  - 8. Loss-of-phase protection.
  - 9. Reverse-phase protection.
  - 10. Short-circuit protection.
  - 11. Motor overtemperature fault.
- K. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bidirectional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.

- L. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.
- M. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load
- N. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.
- O. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
- P. Input Line Conditioning: Integral 5 percent impedance line reactors to reduce the harmonics to the power line and protection from AC line transients. Impedance may be accomplished with dual (positive and negative DC bus) reactors or AC line reactors. AC line reactors are required if only one DC reactor utilized. Additional conditioning or filtering as determined by THD/TDD analysis performed by VFC manufacturer.
- Q. VFC Output Filtering: As determined by THD/TDD analysis performed by VFC manufacturer. dV/dt output filter comprised of three-phase load reactor and resistor/capacitor clipping circuit shall be provide for all VFCs serving submersible motors.
- R. Integral Disconnecting Means: NEMA KS 1, fusible switch with pad-lockable, door-mounted handle mechanism.
  - 1. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
  - 2. Auxiliary Contacts: NO or NC, arranged to activate before switch blades open.
  - 3. NO alarm contact that operates only when circuit breaker has tripped.

## 2.03 CONTROLS AND INDICATION

- A. Status Lights: Door-mounted LED indicators displaying the following conditions:
  - 1. Power on.
  - 2. Run.
  - 3. Overvoltage.
  - 4. Line fault.
  - 5. Overcurrent.
  - 6. External fault.
- B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
  - 1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
  - 2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.
    - a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.
- C. Historical Logging Information and Displays:

- 1. Real-time clock with current time and date.
- 2. Running log of total power versus time.
- 3. Total run time.
- 4. Fault log, maintaining last four faults with time and date stamp for each.
- D. Indicating Devices: Digital display mounted flush in VFC door and connected to display VFC parameters including, but not limited to:
  - 1. Output frequency (Hz).
  - 2. Motor speed (rpm).
  - 3. Motor status (running, stop, fault).
  - 4. Motor current (amperes).
  - 5. Motor torque (percent).
  - 6. Fault or alarming status (code).
  - 7. PID feedback signal (percent).
  - 8. DC-link voltage (V dc).
  - 9. Set point frequency (Hz).
  - 10. Motor output voltage (V ac).
- E. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.
  - 1. Number of Loops: One.
- F. BAS Interface: Factory-installed hardware and software shall interface with BAS to monitor, control, display, and record data for use in processing reports. VFC settings shall be retained within VFC's nonvolatile memory.
  - 1. Hardwired Points:
    - a. Monitoring: On-off status.
    - b. Control: On-off operation.
  - 2. Communication Interface: Comply with ASHRAE 135. Communication shall interface with BAS to remotely control and monitor lighting from a BAS operator workstation. Control features and monitoring points displayed locally at lighting panel shall be available through the BAS. Verify interface protocol with controls contractor.

## 2.04 LINE CONDITIONING AND FILTERING

- A. Input Line Conditioning: Based on the manufacturer's harmonic analysis study and report, provide input filtering, as required, to limit total demand (harmonic current) distortion and total harmonic voltage demand at the defined point of common coupling to meet IEEE 519 recommendations. Provide minimum of 5% line reactors.
- B. Output Line Conditioning: Provide dV/dt output filter comprised of three-phase load reactor and resistor/capacitor clipping circuit for all circuits over 60 feet in length. Verify additional requirements required by pump/motor manufacturer.

# 2.05 OPTIONAL FEATURES

A. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and a notebook computer.

# 2.06 ENCLOSURES

- A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.
  - 1. Dry and Clean Indoor Locations: Type 1.
  - 2. Outdoor Locations: Type 3R.
  - 3. Other Wet or Damp Indoor Locations: Type 4.
  - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

# 2.07 ACCESSORIES

- A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.
  - 1. Push Buttons: Covered.
  - 2. Pilot Lights: Push to test.
  - 3. Selector Switches: Rotary type.
  - 4. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factoryapplied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
- B. Reversible NC/NO bypass contactor auxiliary contact(s).
- C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.
- D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.
- E. Supplemental Digital Meters:
- F. Cooling Fan and Exhaust System: For NEMA 250, Type 12; UL 508 component recognized: Supply fan, with composite intake and exhaust grills and filters; 120-V ac; obtained from integral CPT.
- G. Spare control-wiring terminal blocks; wired.

## 2.08 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.
  - 1. Test each VFC in source shop while connected to its specified motor.
  - 2. Verification of Performance: Rate VFCs according to operation of functions and features specified.
- B. VFCs will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports

## PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.
- B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."
- B. Floor-Mounting Controllers: Install VFCs on 4-inch nominal thickness concrete base. Comply with requirements for concrete base specified in Division 03 Section "Cast-in-Place Concrete."
  - 1. 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.
  - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in each fusible-switch VFC.
- E. Install fuses in control circuits if not factory installed. Comply with requirements in Division 26 Section "Fuses."
- F. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.
- G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- H. Comply with NECA 1.

# 3.03 CONTROL WIRING INSTALLATION

- A. Install wiring between VFCs and remote devices and facility's central-control system. Comply with requirements in Division 26 Section "Control-Voltage Electrical Power Cables."
- B. Bundle, train, and support wiring in enclosures.

- C. Connect hand-off-automatic switch and other automatic-control devices where applicable.
  - 1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
  - 2. Connect selector switches with control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

# 3.04 IDENTIFICATION

- A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each VFC with engraved nameplate.
  - 3. Label each enclosure-mounted control and pilot device.
- B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

## 3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections
- D. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- E. Tests and Inspections:
  - 1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
  - 2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
  - 3. Test continuity of each circuit.
  - 4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).
  - 5. Test each motor for proper phase rotation.
  - 6. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.
  - 7. Correct malfunctioning units on-site, where possible, and retest to demonstrated compliance; otherwise, replace with new units and retest.
  - 8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. VFCs will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

#### 3.06 ADJUSTING

- A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.
- C. Adjust the trip settings of instantaneous-only circuit breakers and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to 6 times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed 8 times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Owner before increasing settings.
- D. Set the taps on reduced-voltage autotransformer controllers.
- E. Set field-adjustable pressure switches.

## 3.07 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.
- B. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

## 3.08 DEMONSTRATION

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

END OF SECTION

# SECTION 331219 FIRE HYDRANTS

# PART 1 GENERAL

# 1.01 DESCRIPTION

A. This section includes materials, testing, and installation of dry barrel fire hydrants.

# 1.02 SUBMITTALS

- A. Submit shop drawings in accordance with the General Conditions and Section 013300.
- B. Submit certificate of compliance with AWWA C502.
- C. Submit manufacturer's catalog data and descriptive literature. Show materials of construction. Submit dimensional drawings. Show coatings.
- PART 2 PRODUCTS
- 2.01 FIRE HYDRANT SELECTION
  - A. Provide fire hydrants of the dry barrel design.
- 2.02 TYPE 492: DRY BARREL FIRE HYDRANT DESIGN
  - A. Fire hydrants shall comply with AWWA C502. Provide frangible section near the ground line designed to break on impact.
  - B. Provide two 2-1/2-inch NFPA 1963 threaded nozzles and one 4-1/2-inch STORZ-style nozzle. Provide cap with chain on each nozzle.
  - C. Inlet Connection of Bury: Mechanical joint.
  - D. Manufacturers and Models: Mueller Super Centurian, Kennedy Guardian, or equal.

## 2.03 BRONZE COMPONENTS IN CONTACT WITH WATER

A. Bronze shall have the following chemical characteristics:

Constituent	Content		
Zinc	7% maximum		
Aluminum	2% maximum		
Lead	8% maximum		
Copper + Nickel + Silicon	83% minimum		

## 2.04 WRENCHES

A. Provide one wrench to operate the hydrant for each hydrant in the project.

#### 2.05 2" POST HYDRANT

- A. 2-inch ductile iron pipe inlet, 2-1/2-inch NST nozzle outlet.
- B. 2-inch self-draining post hydrant with locking cover.
- C. 2-inch riser pipe with breakaway design.
- D. 4' bury depth. Provide fittings for field depth adjustment. Many cleanouts are located at Right of ways lines new road crossing so bury depth will be greater than 4'. The use of poly pipe or rotating saddles or fittings can be used to aid in depth adjustment however in some locations a longer depth hydrant may be required at the contractor's expense.
- E. Kupferle Foundary Co. Model No. 77, or approved equal.

# PART 3 EXECUTION

- 3.01 PAINTING AND COATING
  - A. Coat hydrant top section and the exposed portion of the bury section per Manufacturer's standard coating system. Apply all coats at factory. **Color of finish coat shall be Black.** Apply touch up's and repairs to coating system in field.
  - B. If cement-mortar coated bury sections are used, hold back the mortar coating so it does not extend more than 2 inches above grade.
- 3.02 SIGN
  - A. For hydrants connected to non-potable water pipelines, erect a sign near the hydrant with the following lettering:

# "NON-POTABLE WATER - HYDRANT WILL NOT RECEIVE WATER WHEN SYSTEM NOT IN OPERATION"

- 3.03 FACTORY TESTING
  - A. Test per AWWA C502, Section 5.
- 3.04 INSTALLATION
  - A. Install with the face of the bottom flange of the barrel 4 to 6 inches above the adjacent ground or paving.
  - B. Provide thrust block on bury elbow as detailed in the drawings.

END OF SECTION
### **SECTION 400560**

## AIR-RELEASE AND VACUUM-RELIEF VALVES

PART 1 GENERAL

## 1.01 DESCRIPTION

A. This section includes materials and installation of combination air-release valves for water service.

## 1.02 SUBMITTALS

- A. Submit shop drawings in accordance with the General Conditions and Section 013300.
- B. Submit equipment performance data, operating characteristics, and pressure rating.
- C. Submit manufacturer's catalog data and detail drawings showing all valve parts and described by material of construction, specification (such as AISI, ASTM, SAE, or CDA), and grade or type. Show linings and coatings. Identify each valve by tag number to which the catalog data and detail sheets pertain.
- D. Manufacturer's Certificates: Certify that products of this section meet or exceed specified requirements.
- E. Operation and Maintenance Manual as described in Section 017823.

## PART 2 PRODUCTS

### 2.01 VALVE IDENTIFICATION

- A. Valves are identified in the Schedule by size and type number.
- 2.02 VALVE TAGGING AND IDENTIFICATION
  - A. Provide identifying valve tags on above ground valves.

### 2.03 VALVE DESIGN AND OPERATION

- A. Valve design shall comply with AWWA C512, except as modified herein. Class 150 valves shall have a maximum working pressure of at least 150-psi. Class 300 valves shall have a maximum working pressure of at least 300-psi. All Air, Vacuum, and Combination Valves should be antisurge type such as Vent-O-Mat RBX, Vent-Tech SWP, APCO 1500C, or equal.
- B. Combination air valves shall have a float with lever arm to actuate a poppet valve. A needle shall be attached to the float arm. The poppet valve shall serve to admit large quantities of air when the pipeline drains. The needle shall serve to release small quantities of air as the pipeline fills or as air accumulates in the pipeline.

### 2.04 MATERIALS OF CONSTRUCTION

- A. Materials of construction for air-release, air and vacuum, and combination air valves for water service shall be as follows:
  - 1. Body and Cover: Cast iron; ASTM A48, Class 35; or ASTM A126, Class B or Stainless steel; AISI Type 304 or 316.
  - 2. Float, Lever or Linkage: Stainless steel; AISI Type 316.

- 3. Air-Release Mechanism: Stainless steel; AISI Type 316.
- 4. Poppet, Guide-Rod, Guide-Bushings: Stainless steel; AISI Type 316.
- 5. Fasteners: Stainless steel; AISI Type 316.
- 6. Other Internal Metal Parts: Stainless steel; AISI Type 316.
- 7. Plugs: Bronze; See paragraph B below
- 8. Seat, Plunger, Needle: Buna-N
- B. Any bronze parts in contact with potable water shall be made "Lead-Free" as defined in the "Reduction of Lead in Drinking Water Act." "Lead Free" shall contain no more than twenty-five hundredth of one percent (0.25 percent or less) total lead contained by weight. The manufacturer shall certify that the bronze meets the "Lead-Free" requirement.
- C. Rubber seats shall be made of a rubber compound that is resistant to free chlorine and monochloramine concentrations up to 10 mg/L in the fluid conveyed.
- D. Body and cover bolts, nuts, and capscrews shall be Type 304 stainless steel.

# 2.05 VALVE END CONNECTIONS

- A. Valves 2-inches and smaller shall have threaded ends. Valves 3-inches and larger shall have flanged ends.
- B. Flanges for Class 150 valves shall comply with ASME B16.1, Class 125. Flanges for Class 300 valves shall comply with ASME B16.1, Class 250.
- C. Threaded ends shall comply with ASME B1.20.1.
- 2.06 SERVICE CONDITIONS
  - A. Special service conditions for valves shall be as described in the Schedule at the end of the Section. Design the valves to incorporate the various conditions presented.

# PART 3 EXECUTION

# 3.01 LINING AND COATING

- A. Coat cast-iron valves located above ground or in vaults and structures per Section 099100. Apply the specified prime coat at the place of manufacture. Apply finish coat at the place of manufacture or at the jobsite. Finish coat shall match the color of the adjacent piping.
- B. Coat interior surfaces of cast-iron valves at the place of manufacture per Section 099100. Do not coat seating areas and plastic, bronze, stainless steel, and other high alloy parts. Interior lining shall meet the requirements of NSF 61.
- C. Alternatively, Line and coat cast-iron valves with fusion-bonded epoxy. Do not coat seating areas and plastic, bronze, stainless steel, or other high alloy parts. Interior lining shall meet the requirements of NSF 61.

### 3.02 INSTALLATION

A. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseat or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

- B. Clean threaded joints by wire brushing or swabbing. Apply Teflon® joint compound or Teflon® tape to pipe threads before installing threaded valves. Joints shall be watertight.
- 3.03 VALVE PRESSURE TESTING
  - A. Test valves at the same time that the connecting pipelines are pressure tested. See Section 400522 for pressure testing requirements. Protect or isolate any parts of valves, operators, or control and instrumentation systems whose pressure rating is less than the test pressure.

#### 3.04 VALVE SCHEDULE (SEE NEXT PAGE)

A. This schedule is provided as a "courtesy" to the Contractor and is not intended to be a complete and final list. Any air-release, air-vacuum, combination air-release air-vacuum valves, or combinations thereof shown on the process drawings that are not provided by the manufacturer or included in this Schedule are still the responsibility of the Contractor.

STATION	TAG NO. / DETAIL	PRESSURE CLASS	TAP SIZE, OUTLET ORIFICE SIZE	OPERATOR/TYPE	CONNECTION	REMARKS		
COMBINATION AIR AND VACUUM RELEASE VALVE								
INTAKE PUMP DISCHARGE	ARV-1 - D108/6	250		SINGLE BODY	THREADED			
INTAKE HEADER	ARV-2 - D108/6	250						
30+52			3", 3/16"					
BOOSTER SUCTION HEADER	ARV-3 - D108/6							
BOOSTER DISCHARGE HEADER	ARV-4 - D108/6							
87+75								
130+50								
144+00								
163+00								
177+50								
191+00		250		SINGLE BODY	THREADED			
222+33		250		SINGLE BODY	THREADED			
225+58								
237+50								













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